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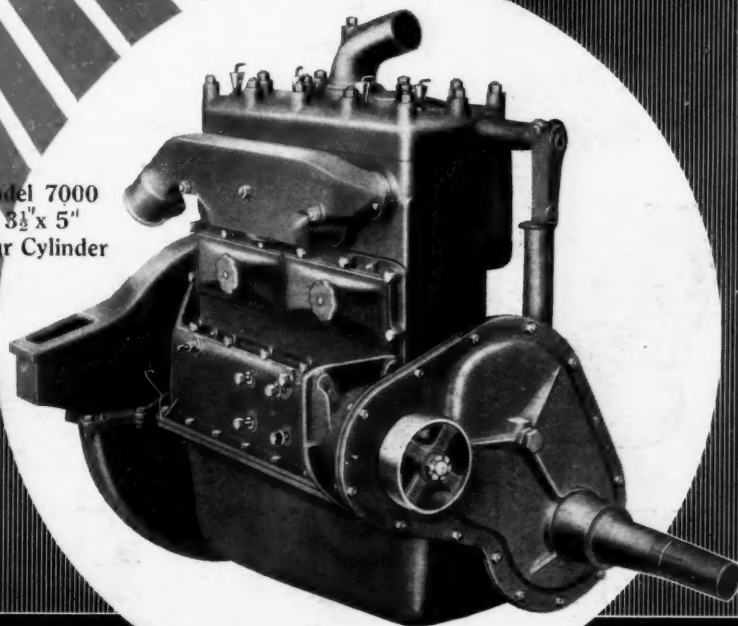
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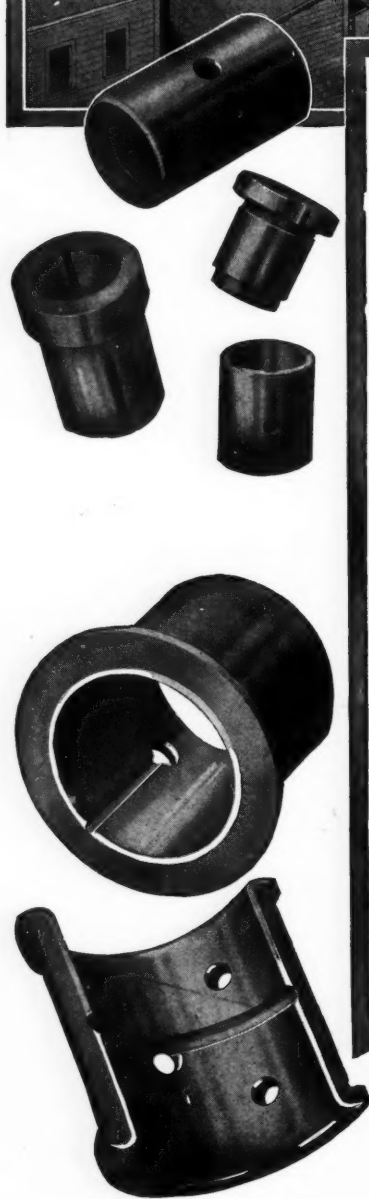
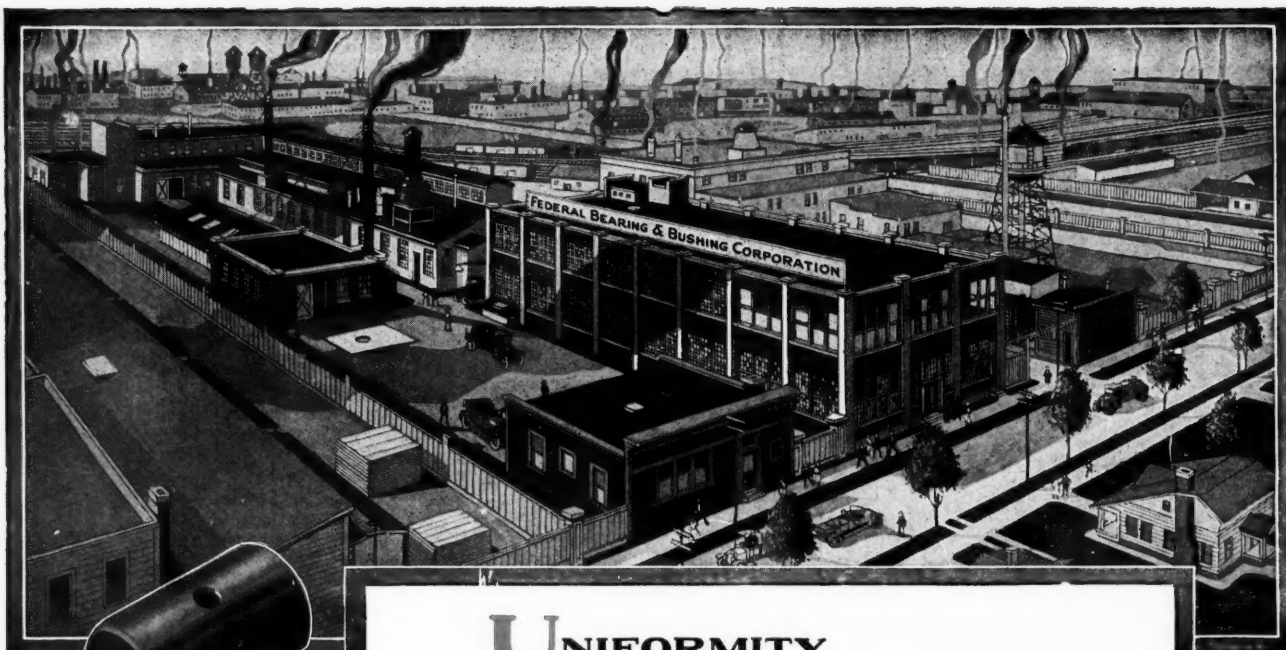
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AUTOMOTIVE INDUSTRIES

The AUTOMOBILE

VOL. XLIII

NEW YORK—THURSDAY, SEPTEMBER 2, 1920

No. 10

The Trend of the Oil Industry During First Half of 1920

With automotive fuel question uppermost in the minds of the industry, this review of the half year, as to stocks, exports and production, compared with a year ago, should be instructive and interesting.

By Joseph E. Pogue*

AS the producer and purveyor of motor fuel and motor lubricants, the oil industry is of direct concern to automotive interests, and the progress of the oil industry is a matter of sufficient importance to be closely followed by all who are interested in the welfare of automotive transportation. The present article attempts to interpret the trend of the oil industry during the first half of 1920 in so far as the events bear upon the automotive field.

The dominant raw material employed in the manufacture of both gasoline and lubricants is crude petroleum, and therefore the quantity of crude petroleum available for consumption is a fundamental factor in determining the supply of the petroleum products of interest to the automotive industry. The supply of crude petroleum for the first half of 1920 compared with that for the corresponding period of 1919 is shown in Table 1. (See following page for table and drawing.)

The outstanding feature brought out by Table 1 and illustrated graphically in Fig. 1 is the discordant rate of increase between domestic production and con-

sumption; the latter increasing 36 per cent as compared with a 20 per cent advance in production. This excess of consumption over domestic production is made possible by imports from Mexico, which have increased 62 per cent. The United States, therefore, is already partly dependent upon foreign sources of supply and bids fair to become increasingly so.

The unmined supply.—Considerable attention in 1920 has been devoted to the Geological Survey's estimates of the unmined supply of crude petroleum in the United States. For years the Survey has been making geological surveys of the oil fields of this country and has accumulated an immense quantity of detailed engineering data on the extent and structure of oil-bearing formations and the thickness and porosity of the oil-sands; while the Bureau of Mines, the Bureau of Internal Revenue of the Treasury Department, and many geological engineers in private employ have gathered extensive data on the rate of decline of oil wells. Out of this mass of data has come an inventory of the available oil still underground in this country which runs in order of magnitude around 7 billion barrels. The figures of the Geological Survey in this respect, corrected for the

*Industrial economist and engineer, Sinclair Consolidated Oil Corp.

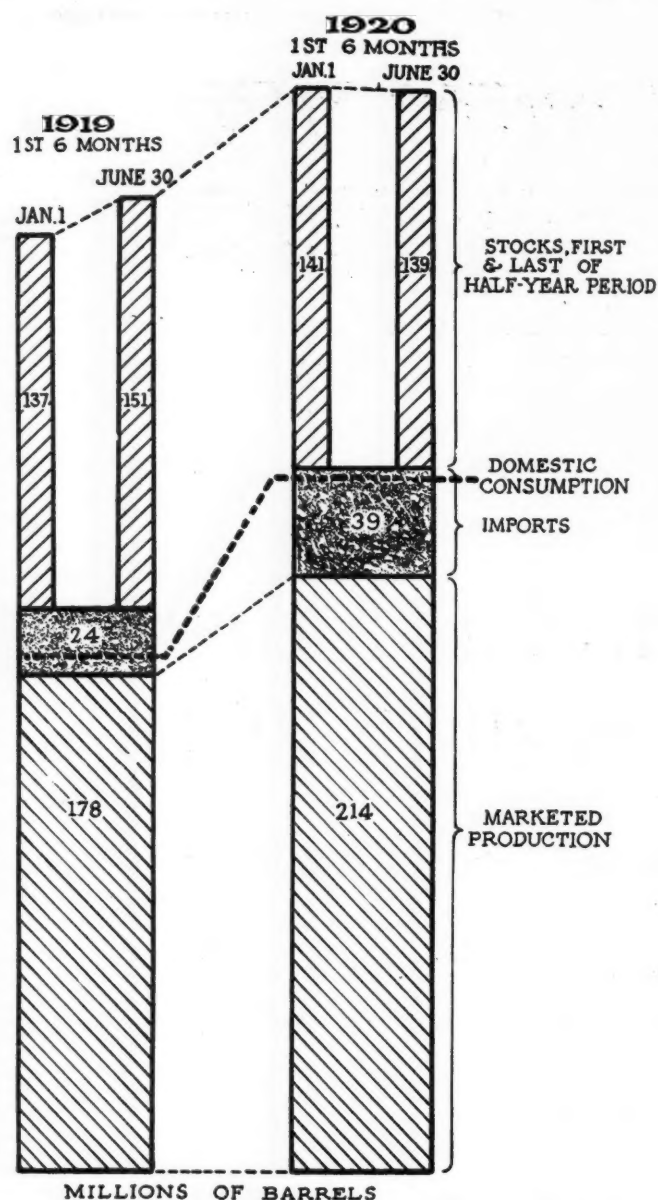


Fig. 1—The crude petroleum situation for the first six months of 1919 and 1920

Table 1—Comparison of Domestic Production, Imports, Exports and Stocks of Crude Petroleum for the First Six Months of 1919 and 1920

Unit: 1,000,000 barrels

	First 6 months 1919	First 6 months 1920	Percent change
Marketed production.....	178	214	+20%
Imports.....	24	39	+62%
Exports.....	3	3	0%
Stocks—Jan. 1.....	137	141	+2%
Stocks—June 30.....	151	139	-7%
Consumption.....	185	252*	+36%
Crude to stills.....	167	192*	+15%

*Approximate, on basis of official figures for first five months and author's estimate for June.

oil extracted in 1919 so as to represent the situation Jan. 1, 1920, are graphically interpreted in Fig. 2. The point to be emphasized is that even if the estimate falls 100 per cent below the true figures, the

resource would still be meager in view of the mounting demands for petroleum.

The relative meagerness of the crude oil supply of the United States, in view of a consumptive demand that has already passed the 400 million barrel mark, has naturally directed attention to the probable reserves of oil in foreign countries. David White, Chief Geologist of the U. S. Geological Survey, who has been instrumental in the domestic petroleum inventory, has just published a paper ("The Petroleum Reserves of the World," Annals of the American Academy, May, 1920) in which he gives a much more generalized estimate of the unmined petroleum supply throughout the world. This estimate is confessedly based on very meager evidence and in no way is comparable in reliableness to the domestic inventory; but it represents the best scientific guess in the matter and runs as follows:

Table 2—Estimated World's Petroleum Deposits

	Millions of barrels
United States and Alaska.....	7,000
Canada.....	995
Mexico.....	4,525
Northern South America, including Peru.....	5,730
Southern South America, including Bolivia.....	3,550
Algeria and Egypt.....	925
Persia and Mesopotamia.....	5,820
Southeast Russia, Southwest Siberia, and the region of the Caucasus.....	5,830
Roumania, Galicia, and Western Europe.....	1,135
Northern Russia and Saghalien.....	925
Japan and Formosa.....	1,235
China.....	1,375
India.....	995
East Indies.....	3,015
Total.....	43,055
Total Eastern Hemisphere.....	21,255
Total Western Hemisphere.....	21,800
Total north of equator.....	36,400
Total south of equator.....	6,655

The Mexican Situation.—With growing realization of the inability of the domestic supply to sustain in full the mounting requirements for crude petroleum, increasing interest has been directed to the oil fields of Mexico which are already filling a considerable gap between domestic production and consumption. During the early part of 1920 this interest became acute, with the spread of reports to the effect that our future imports of petroleum were menaced by restrictive regulations on the part of the Mexican government. Since that time, however, a revolution in Mexico has taken place and conditions are now regarded in many quarters as more favorable for the rapid development of the oil resources of that country. During 1920 imports of crude petroleum from Mexico have increased, as shown in the following table:

Table 3—Imports of Crude Petroleum from Mexico, January-June, 1920

	Millions of Barrels
January.....	6.29
February.....	4.94
March.....	6.50
April.....	6.19
May.....	6.96
June.....	8.11
TOTAL.....	39

Oil-Land Leasing Act.—After ten years of agitation an oil-land leasing act, opening to development some 6,000,000 acres of withdrawn oil lands, was passed by Congress and signed by the President in February. This act concerns oil-bearing lands in Wyoming and California chiefly, and will stimulate the output of oil in those states. The act provides for leasing to private individuals, the Government retaining the title, on a royalty basis. A unique provision is that the royalty is to be paid in oil and gas upon demand by the Secretary of the Interior, according to a clause inserted at the instance of the Shipping Board. The act does not enlarge the oil resources of the United States, but merely makes a small portion more quickly available.

Petroleum Products

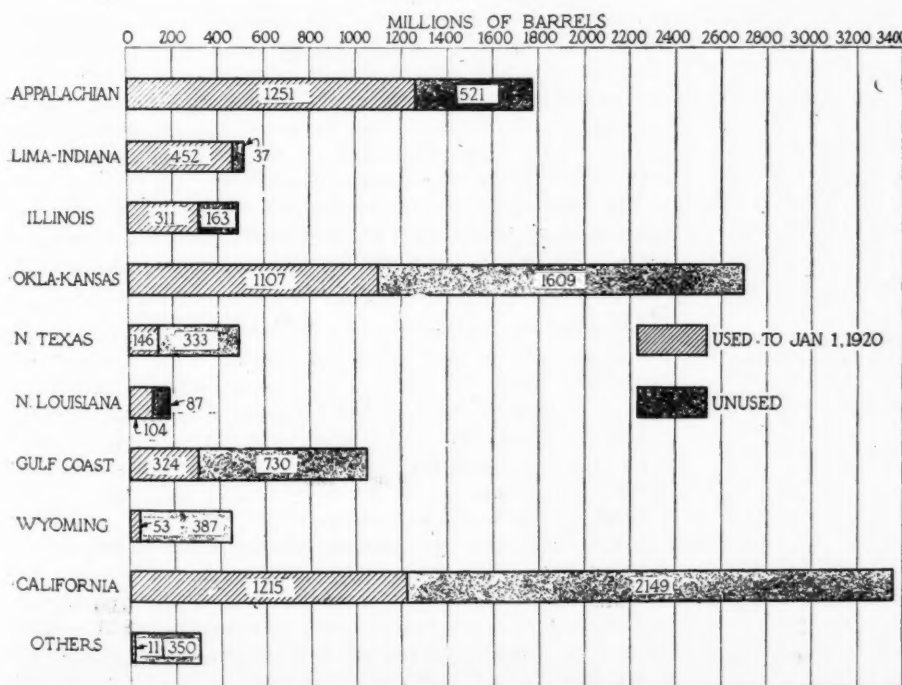
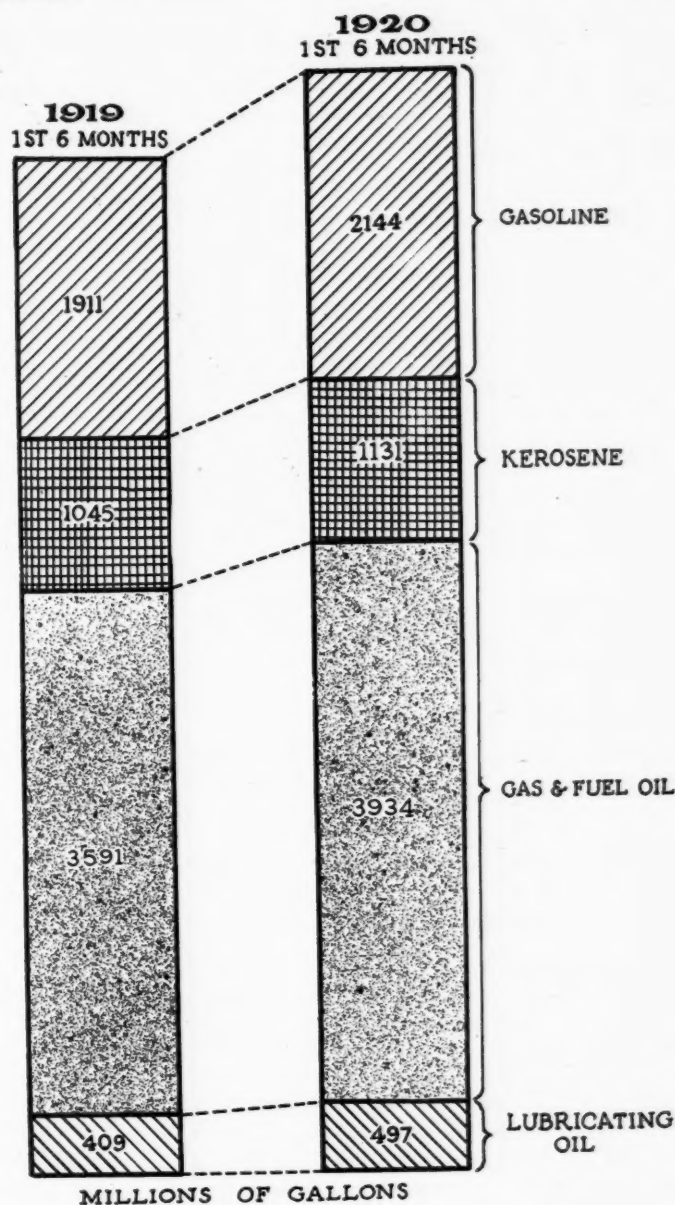
Most of the crude petroleum consumed in the United States goes first to the refineries, where it is manufactured into petroleum products, of which the most important are gasoline, kerosene, fuel oil (including a special variety termed gas oil), and lubricating oil. The intake and output of the refineries of this country for the first half of 1919 and 1920 compared are shown in Table 4, while Fig. 3 shows graphically the production of the main petroleum products.

Table 4—U. S. Production of Petroleum Products During the First Six Months of 1919 and 1920

Unit: 1,000,000

	First 6 months 1919	First 6 months 1920*	Percent change
Crude run (bbls.).....	167	194	+15%
Oils purchased and re-run (bbls.)	24	18	-25%
Gasoline (gal.).....	1911	2144	+12%
Kerosene (gal.).....	1045	1131	+ 8%
Gas & Fuel Oil (gal.).....	3591	3934	+ 9%
Lubricants (gal.).....	409	497	+21%

*Approximate, estimated on the basis of official figures for Jan.-May, and author's estimates for June.



Above—Fig. 3—Comparison of the production of petroleum products in the United States for the first half of 1919 and 1920. Data from U. S. Bureau of Mines 1920 figures approximate

At the left—Fig. 2—The oil reserve of the United States, Jan. 1, 1920. Prepared from estimates published by the U. S. Geological Survey

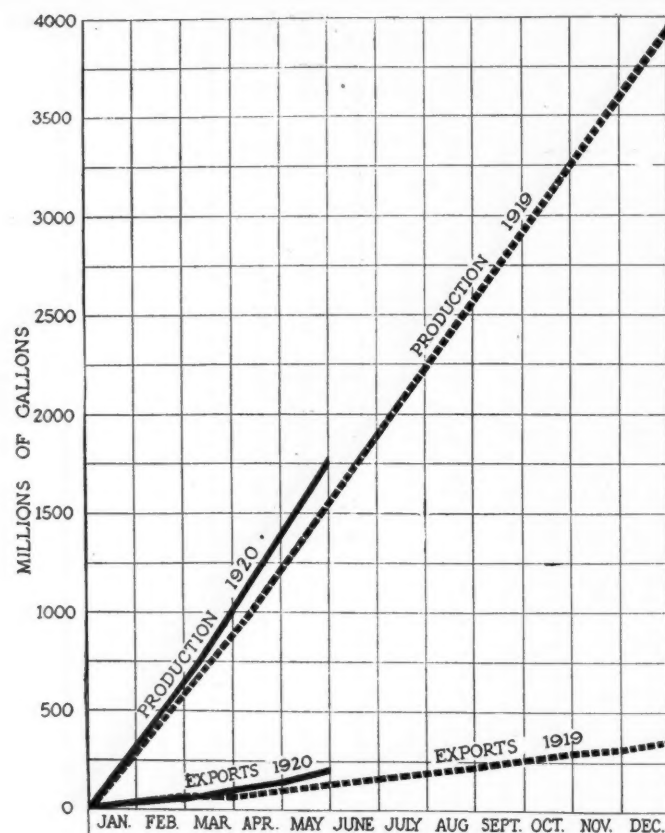


Fig. 4—Cumulative chart showing the trend of production and exports of gasoline by months during 1919 and 1920

Gasoline.—The petroleum product of foremost interest to the automotive industry is gasoline. The output of this product increased from 1911 million gallons during the first half of 1919 to 2144 million gallons during the corresponding period of 1920, an advance of 12 per cent. It is probable that the requirements of automotive transportation have grown somewhat in excess of 12 per cent for the same period, although unfortunately for purposes of comparison automotive statistics are not promptly or very accurately available.

In January, 1920, the U. S. Bureau of Mines conducted a motor-gasoline survey of the United States, collecting 800 samples of gasoline in use in various parts of the country and subjecting them to chemical examination. The purpose of the survey was to determine how much change has taken place in motor-gasoline since April, 1919, when a similar survey was made. The conclusion reached was that "on the whole there has been little change in the nature of the motor fuel marketed throughout the country during the period from April, 1919, to January, 1920," the summary of results being as follows:

Table 5—Summary of Distillation Tests Conducted by Bureau of Mines in Connection with a Survey of Motor Gasoline January, 1920

Results in degrees Fahrenheit						
	First drop	20%	50%	90%	Dry point	Average boiling point
All districts—Apr. 1919	120	199	260	371	417	265
All districts—Jan. 1920	119	200	259	369	427	264
Difference.....	-1	+1	-1	-2	+10	-1

It will be observed that there was an average rise in end point of 10 deg. F. over the period noted. During that time, also, there was an ample supply of gasoline, growing out of the fact that the oil industry was stimulated during the closing months of the war in contrast to a diversion of the automotive industry in significant measure to munition manufacture, which lead to an easement of demand. A somewhat greater change in end point is to be anticipated during the present summer, now that the requirements of demand are again under full headway and pressing hard upon supply.

Fig. 4 shows a comparison of the trend of gasoline production and exports in 1919 with the course of these items for the first five months of 1920.

Kerosene.—Although subordinate in importance to gasoline, kerosene is, nevertheless, of growing interest to the automotive industry as tractor fuel and as a motor-fuel reserve which may ultimately be more extensively drawn upon. The output of kerosene during the first six months of 1920 amounted to 1131 million gallons as compared with 1045 million gallons during the similar period of 1919, an increase of 8 per cent.

Some advance has been registered in the use of kerosene in the internal combustion engine, and it is roughly estimated that half of the fuel consumed by tractors is now this product. The automotive industry, however, is beginning to realize that kerosene does not constitute the outstanding fuel reserve that it was once regarded to be; that the paramount problem ahead is to make more broadly available the much larger reserve of fuel oil.

Gas and Fuel Oil.—Gas and fuel oil are of indirect concern to the automotive industry, since they constitute a motor-fuel reserve roughly twice as large as the present output of gasoline. This reserve is being eaten into through the conversion of a growing quantity of gas oil into gasoline by cracking methods of distillation, and also more directly by the requirements of the heavy-oil engine. A growing utilization of fuel oil in both directions is to be anticipated. The demand for gas oil for purposes of cracking, indeed, has become so insistent as to create a shortage of this product, to the embarrassment of the city gas industry, which uses gas oil for enriching its product. The gas companies, faced with a growing stringency and increasing price for this product, which they once got cheaply and abundantly, have been slow to realize that their raw material is being inexorably preempted by a requirement of higher economic rank. Ultimately gas standards and manufacturing technology will have to be adjusted to get along without gas oil, which soon may be expected to travel exclusively the route of cracking.

The output of gas and fuel oil combined during the first half of 1920 was 3934 million gallons, compared with 3591 million gallons for the corresponding period of 1919, an increase of 9 per cent.

Lubricating Oils.—The statistics on lubricating oils unfortunately do not separate the motor-oils from the lubricants used for other purposes, although the former constitute nearly half of the total; so the two types are reviewed together. Comparing the first half of 1920 with the corresponding period of 1919, the output of lubricants increased from 409 million gallons to 497 million gallons, an advance of 21 per cent. During the past half year an appreciable stringency has developed in the heavy-bodied lubricants such as enter into the composition of the medium and heavy grades of motor-oils; this outcome was presumably the result of the heavy burden placed upon such grades by the rapid expansion of automotive equipment, especially in the

heavy-traction field of trucks and tractors, coupled with a growing appreciation that much automotive equipment in the past has been lubricated with oils of too thin a body.

The problem of dilution of crank-case oil by the unburned components of the fuel has come in for increasing consideration; and there is growing appreciation of the fact that a changing fuel has a bearing upon the type of lubricant to be used, introducing the necessity of considering the balance between engine, fuel, and lubricant.

Refinery Capacity

In January, 1920, the Bureau of Mines published an inventory of the refinery capacity of the United States which showed that the refinery equipment of this country, not to mention that under construction, is in excess of the crude petroleum available for consumption which averaged 1,340,000 barrels daily on the basis of the first six months of 1920. The summary figures from this report compared with earlier data are presented in Table 6:

Table 6—Refinery Capacity of the United States

Number of refineries Jan. 1, 1919	Daily capacity in barrels	Number of refineries Jan. 1, 1920	Daily capacity in barrels	Under Construction	
				No.	Capacity
289	1 295,115	373	1,530,565	99	263,500

Exports

The exports of petroleum products from the United States for the first six months of 1920 compared with the corresponding period of 1919 are shown in Table 7:

Table 7—Exports of Petroleum Products from the U. S. During the First Six Months of 1919 and 1920

Unit: 1,000,000 gallons

	First 6 months 1919	First 6 months 1920*	Percent change
Gasoline & Naptha.....	182	292	+60
Kerosene.....	481	411	-15
Gas & Fuel Oil.....	295	397	+34
Lubricating Oil.....	148	223	+50

*Approximate: based on official figures for Jan.-May, and author's estimate for June.

The Motor Fuel Problem

In 1919 the automotive industry, realizing the approach of a motor-fuel problem, took its first official steps in meeting the issue by directing attention to this matter through the Society of Automotive Engineers and the National Automobile Chamber of Commerce. Several meetings were held between representatives of the automotive and oil industries and initial discussions took place, which have continued into 1920. The Automotive Fuel Committee of the Society of Automotive Engineers presented a report before the June meeting of the Society on "The Utilization of Present Fuels in

Present Engines," which starts out with a rather strong statement that the "very life of the industry depends upon the adoption of some better means of vaporization and distribution."

The report goes on to discuss the utilization of fuel of relatively high end points (low volatility) and advocates the formation of fog mixtures with the aid of the exhaust heat from the engine. Various types of manifolds for achieving this end are briefly described and the report concludes with a plea against the present tendency "toward making high volumetric efficiency secondary in importance to securing the best average performance with respect to power, economy, low maintenance cost and long service between cleaning the combustion chamber and spark plugs."

The report touched only one phase of the problem of fuel utilization, that having to do with the better handling of present-day fuels in current equipment, leaving to one side the broader problem of how to enlarge the fuel supply through more radical adaptations on the part of the engine.

The National Automobile Chamber of Commerce is to be praised for registering an advance in the presentation of automotive statistics in 1920 over the assemblage of facts that has characterized its previous statistical exhibits. "Facts and Figures of the Automotive Industry" for 1920 is a valuable compendium of especial service in affording a basis for appraising the growth of the demand for gasoline. Automotive statistics, however, are still far short of their true deserts, and it is to be hoped that in the absence of Government initiative in this respect the automotive industry will see the value of a scientific and detailed current census of its development such as may be used in meeting the collective problems of the industry.

Prices

The prices of gasoline and motor-oil have advanced markedly since the first of the year, and the increase has naturally caused widespread interest and apprehension on the part of the automotive industry as well as the public at large. The causes underlying these advances are many, but the basic factor in the prices of petroleum products is the cost of crude petroleum; and the price of the latter, under the stimulus of a demand exceeding the available supply, advanced over a range of 19 to 100 per cent during the first half of the year. Table 8 shows the price changes of some typical grades of crude:

Table 8—Price Changes of Crude Petroleum During the First Half of 1920

GRADE	Price per bbl. Jan. 1	Price per bbl. June 30	Percent increase
Pennsylvania.....	\$5.00	\$6.10	22
Kansas-Oklahoma.....	2.75	3.50	27
Ranger.....	2.75	3.50	27
Humble.....	1.50	3.00	100
Salt Creek.....	1.75	2.75	57
San Joaquin.....	1.24	1.49	20

The advances in the price of gasoline have been somewhat less than the increase in crude prices during the half-year periods under view. Table 9 shows the changes in wholesale or tankwagon price for gasoline at various points in the country:

Table 9—Changes in the Tankwagon Price of Gasoline During the First Half of 1920

LOCALITY	Price Jan. 7, 1920 Cents per gallon	Price June 30, 1920 Cents per gallon	Percent increase
New York.....	25.5	30.0	17
Cleveland.....	25.0	29.0	16
Chicago.....	21.0	26.0	24
Atlanta.....	23.5	28.5	21
Kansas City.....	21.2	26.2	24
San Francisco.....	21.5	23.5	9

The price changes for kerosene covering the same localities noted under gasoline are shown in Table 10:

Table 10—Changes in the Tankwagon Price of Kerosene During the First Half of 1920

LOCALITY	Price Jan. 7, 1920 Cents per gallon	Price June 30, 1920 Cents per gallon	Percent increase
New York.....	18.0	18.0	0
Cleveland.....	15.0	20.0	33
Chicago.....	15.5	18.5	19
Atlanta.....	16.5	20.5	24
Kansas City.....	14.6	17.6	20
San Francisco.....	12.5	13.5	8

The bulk price of gas and fuel oil at the refinery has also changed approximately in the ratio already observed for gasoline and kerosene, with somewhat greater advances in the use of gas oil, which has fallen under a competitive demand for cracking into gasoline and for carbureting city gas.

Unfortunately no price quotations are published in the trade press covering the price of motor oils, but the prices of the oils entering into motor lubricants are listed. Lubricants have advanced more sharply than the other oil products during the period under discussion, especially the heavier grades. The price changes of lubricants are explainable on the basis of their highly fabricated character in comparison with the other bulky oil products, coupled with a shortage in the grades of crude customarily utilized in lubricating manufacture. Table 11 shows the price changes for a few types of basic lubricating oils:

Table 11—Price Changes in Lubricating Oil During the First Half of 1920

TYPE	Price Jan. 7 Cents per gallon	Price June 30 Cents per gallon	Percent increase
200 visc. Penn. Neutral No. 3 asso. filt.	27	35	29
200 visc. Okla. Neutral No. 3 Col.	17½	27¼	54
Penn. Cyl. Stock 60, steam refined	33½	48½	45
Penn. Cold Test Bright Stocks	65	86	32

The price changes noted above came dominantly during the first quarter of the year. The cause of these

changes was investigated at the direction of Congress by the Federal Trade Commission, who reported essentially as follows:

- 1—It seems that there is greater justification in assigning the advance in price of crude oil and petroleum products to varying conditions of supply and demand in the light of emphasized and pessimistic statements as to the future of supply than to a combination in restraint of trade.
- 2—It is probably true that the recent advances in the prices of petroleum products (gasoline, kerosene, gas oil, and fuel oil, and lubricants) have been due primarily to the strong demand for such products, coupled with difficulty of many companies in getting adequate supplies of crude oil, the increased prices thereof and the increase in other expenses of operation.

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Steam Vehicle Persistence

ENGINEERING, of London, reports the discussion of a paper on "Road Transport by Steam Vehicles," before the Institution of Mechanical Engineers, and credits L. A. Legros with the statement that "the steam vehicle made three attempts to come into existence and only achieved success on the third effort."

Certainly a fine record of persistence to have been achieved by an inanimate object while still in the non-existent state.

A Gaging Fixture for the Relation of the Cams to Keyway

In order to insure the interchangeability of cams used in ignition interrupters it is necessary that the angular relation of the breaking point on the cam and the keyway on the shaft be very accurately measured. An instrument for that purpose is described here that is rapid and easily operated.

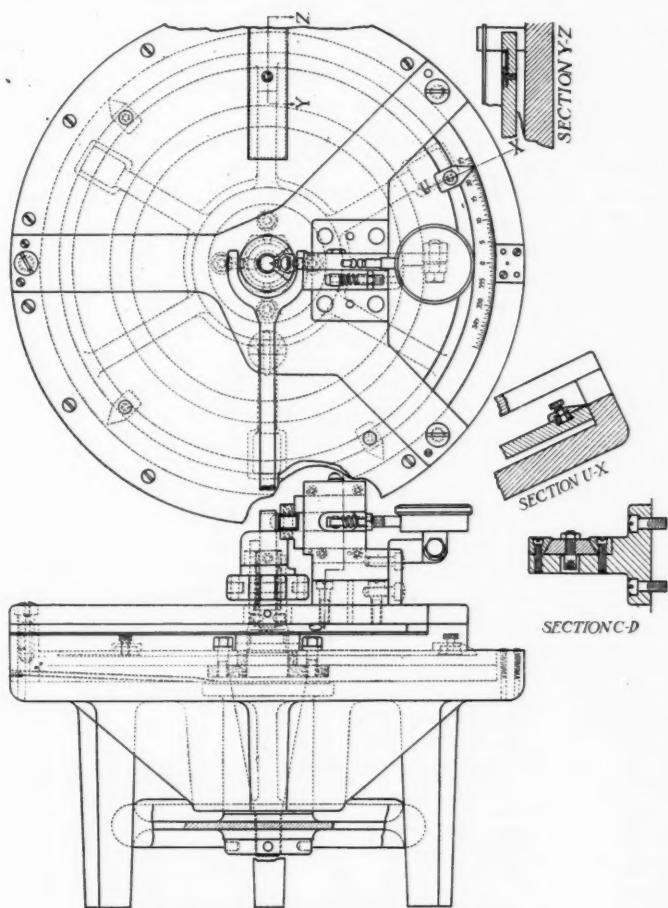
IN the manufacture of ignition magnetos it is essential that the cam operating the interrupter be made with great accuracy. In order to insure absolute interchangeability of cams the angular relation of the keyway to the "breaking point" must be the same within very narrow limits. It is also desirable to be able to check the opening of the breaker points which the cam will give and the angular relation of the keyway to the "leading off" point.

To be able to check up the breaker cam rapidly and accurately, the Splitdorf Electrical Co. has designed and constructed a special cam testing fixture of which two views are shown herewith. It consists of a frame in the form of a three-legged table which can be set on the bench and is dished to receive a circular brass plate with a dull nickel finish. This plate is secured to a spindle having a tapered bearing in a hub formed on the under side of the table. Extending upward from the center of the plate is a stud for carrying the cam to be tested. On top is mounted an extractor for quickly removing the cam. This is in the form of a lever and a grooved collar. To the bottom of the tapered shank is fitted a hand wheel which is threaded to the spindle and held in place by a check nut.

The brass plate forming the main revolving portion of the fixture has a dull nickel finish and is fastened to the taper spindle by means of three screws. This plate is graduated to $\frac{1}{2}$ deg. divisions. To the frame is secured an index plate with a zero mark, this plate being held in place by two flat head screws. In use, after the cam has been put in place, the spindle, with the graduated plate and the cam under test, is turned by hand by means of the hand wheel under the table, and by watching the dial it can then be noted when the breaking point is attained. The angular relation of this point to the keyway is then read

off on the graduated scale on the brass plate attached.

A three armed spider is secured to the top of the frame, for supporting the dial indicator used for checking the cam.



Gaging Fixture for Cams in Relation to Keyways

The bracket on which this gage is mounted is provided with a horizontal dovetail slide with an extension for holding the cam follower. There is a knurled finger grip on one side and a spring for holding the cam follower against the cam on the other. The dial indicator is secured to a small bracket attached by screws against the end of the gage bracket. The gage is set by means of a master cam to such a point that when the cam is placed on the stud, the cam follower radius corresponds to the radius of the interrupter.

In addition to checking up the breaking point, the apparatus may be used for checking up what is referred to as the "leading off" point, that is, the angular position at which the cam follower leaves the cam surface.

The gage department of the Splitdorf Electrical Co. has also devised a simple but ingenious gage for testing the radial location of the keyway with relation to the bore. First a piece of nearly flat stock is put into

the keyway. This is slightly tapered, the taper for the length of the keyway corresponding to the tolerance allowed in same, so that by pressing the flat piece endwise, it can always be made rigid in the keyway. Next, two test feelers of segmental section are dropped in on opposite sides of this flat piece. If the keyway is not exactly radial, one of these test feelers will go in farther than the other. These test feelers have marks on them and the longitudinal displacement must not exceed a certain limit.

THE Bureau of Immigration reports that more than 5,000 immigrants are arriving at Ellis Island daily and that the number is restricted only by transportation facilities.

Two-Passenger Car Engines Are the Product of an Old Company

These two models differ only in the cylinder dimensions and are six cylinder, valve in head type with detachable cylinder heads. A special design of exhaust manifold employs a hot air stove connected to the carbureter. The carbureter mounted high on the engine facilitates adjustment.

THESE models are the product of a company which has been manufacturing engines for many years. Of recent years it has been concentrating on tractor engines exclusively, and these two engines mark the re-entrance of the Beaver Manufacturing Co. into the passenger car field.

Both of these models have six cylinders and differ only in the cylinder dimensions. In the following description, therefore, no distinction will be made. The larger model is a $3\frac{1}{2} \times 5\frac{1}{4}$ engine and known as the C-L and the smaller has $3\frac{5}{16} \times 5\frac{1}{4}$ in. cylinders and is known as the C-J.

The cylinders are cast in block of gray iron. They are rough bored and tested for water tightness and then finish-reamed and ground to size. The cylinder head is removable and held down by a large number of evenly spaced bolts with a copper-asbestos gasket between the block and the head. Water is circulated through the head and entirely around the valve chambers and spark plug vents.

There are two valves per cylinder and they are interchangeable. The valve diameter is $1\frac{11}{16}$ in. and the lift $\frac{7}{16}$ in. They have cast iron heads welded to carbon steel stems of $\frac{3}{8}$ in. diameter. The valve stem guides are made of cast iron and are renewable. The valve tappets are of the roller type. The entire valve mechanism is inclosed in an aluminum cover.

The pistons are made from the same grade of iron as the cylinders. They are turned and then ground to size. There are three expansion rings to each cylinder and each piston has two oil grooves turned on the outside. The piston pin is made of special steel tubing, hardened and accurately turned to size. The pin is held in place by means of a lock screw tapped into the piston pin bosses. The bearing is a phosphor bronze bushing.

The connecting rods are of I-beam construction and made of 35 point carbon steel. The connecting rod caps are held in position by two nickel steel bolts. The bearing is of bearing metal backed with bronze. Laminated shims are used for adjustment. The length of the rod is 11 in. and the bearing is $2\frac{1}{4} \times 2$ in.

The crankshaft is of the three bearing type. The front bearing is $2\frac{1}{4} \times 2\frac{3}{4}$ in., the center $2\frac{5}{16} \times 2\frac{3}{8}$ in. and the rear bearing $2\frac{3}{8} \times 3\frac{1}{4}$ in. The flywheel is bolted to

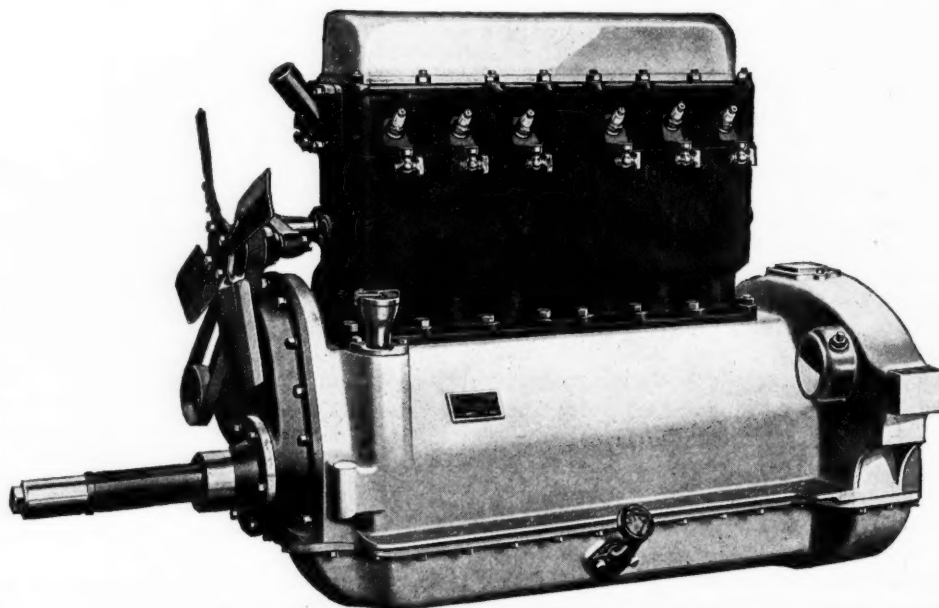
an integral flange on the crankshaft by six bolts. The camshaft is $1\frac{1}{4}$ in. in diameter and is a one-piece drop forging. The thrust is taken up by means of a plunger device operating against a hardened steel disk located in the front cover.

The crankcase is made in two parts from special aluminum alloy. The upper half furnishes the support for the crankshaft bearings and is of light and rigid construction. Fourteen studs are provided which hold the cylinder block in position. The lower half contains the splash plate and serves as an oil reservoir. All timing gears are of wide face, helically cut on automatic hobbing machines. The gears are lubricated by a separate oil lead inside the oil-tight gear case.

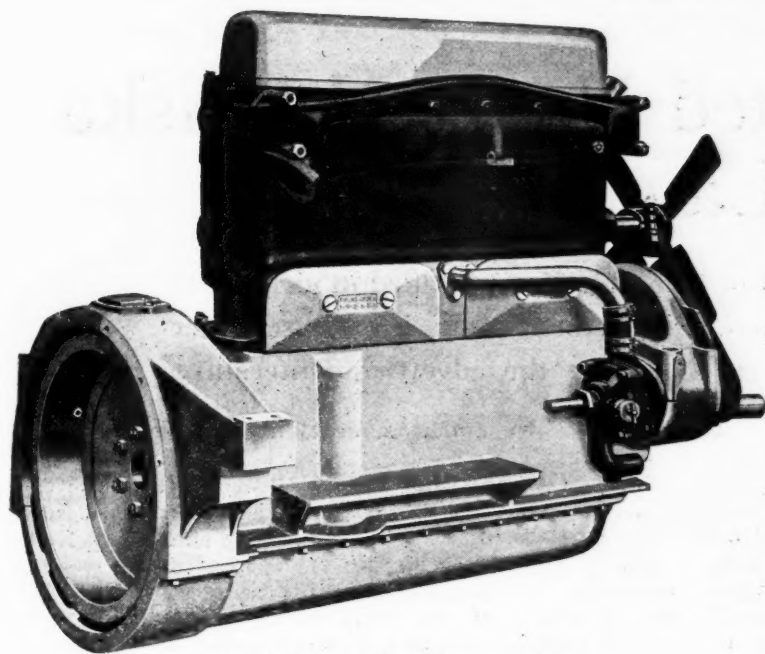
The exhaust manifold is placed on the camshaft side of the engine and is fastened to the cylinder head by means of brass nuts and a copper-asbestos gasket. The design gives a hot air stove connection to the carbureter which is mounted high on the engine.

The water is circulated by a large centrifugal pump with a bronze impeller with large bearings. The magneto is driven from the water pump shaft whose direction of rotation is clockwise.

Lubrication is by the semi-force feed system. Oil is forced to the main bearings and camshaft bearings by means of a gear pump situated in the oil reservoir. The correct level for the splash to the connecting rods and pis-



Starter side of Beaver six-cylinder engine



Valve side of the Beaver engine

tons is automatically maintained by the constant flow of the returning oil to the reservoir. The rocker arms are lubricated through a hollow shaft by means of a special oiling device connected to the main feed line. The surplus oil on its return lubricates the valve tappet guides. A brass screen of fine mesh prevents any sand or dirt getting to the bearings.

The C-J has a piston displacement of 271.5 cu. in. and its S.A.E. rating is 25.4 hp. It develops 55 hp. at approximately 2000 r.p.m. The weight is 625 lb. with flywheel and regular equipment.

The C-L is rated at 29.4 hp. and has a piston displacement of 303-1 cu. in. It develops 60 hp. at the same speed. The weight is 650 lb. Both models have a maximum r.p.m. of between 2800 and 3000.

A BELGIAN publication *L'Automobile*, reports a test made on an Austrian Daimler car with four-cylinder 3.54 x 5.52 in. engine, in which the fuel consumption figured out to one U. S. gallon per 28 miles (13.5 liters for 100 kilometers). The maximum speed attained was 56.6 m.p.h. The chassis alone weighs about 2200 lb.

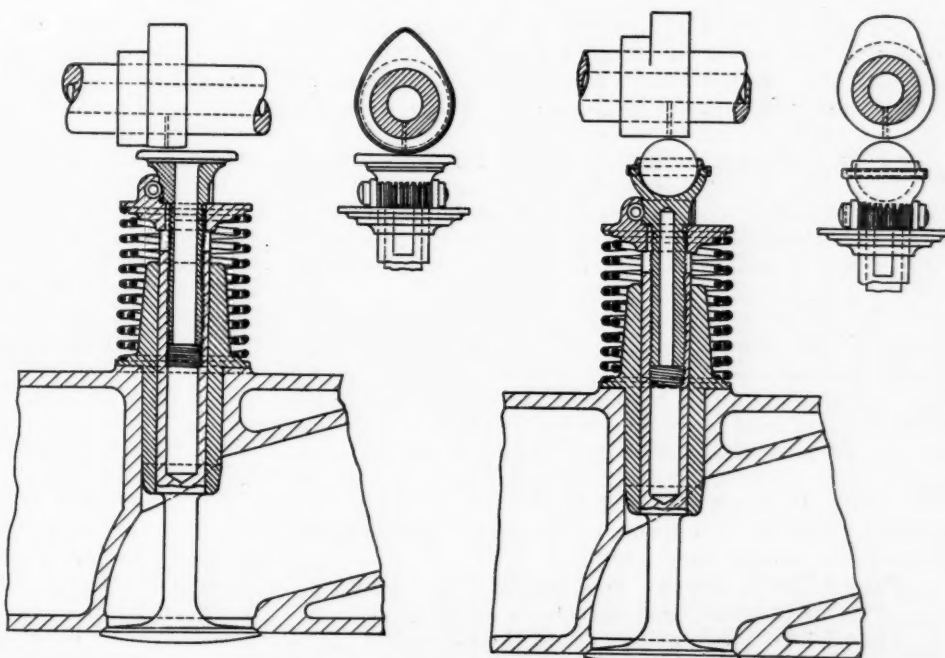
Micrometer Adjustment for Valve Stems

WHEN valves in the cylinder head are to be operated directly from an overhead camshaft the problem of means for adjusting the necessary clearance presents considerable difficulty. One solution is that of Birkigt, which is used generally on aircraft engines having this form of valve mechanism. Another solution of the problem has been worked out by Wm. C. Davidson, and two applications of Mr. Davidson's invention are illustrated herewith. In one design the valve stem is provided with a mushroom type top to serve as follower, and in the other it has a ball top.

By this invention the need for an intermediate lever or rocker arms is eliminated, and the construction is claimed to reduce noise, friction and wear and to facilitate the removal of the valve. Lubrication of the ball or mushroom top and of the valve stem parts is accomplished by oil being fed under pressure through the hollow camshaft and a hole drilled through the back of cam, which is in direct line with the valve stem, to the valve stem parts.

The stem is enlarged a short distance above the valve, and at its top there is a slot milled across it to allow the valve spring washer to be guided therein by means of keys. This will allow free movement of the washer up and down, but no rotary motion. The enlarged portion of the stem is drilled out as shown and threaded inside to allow the extension end of the ball

support, which is threaded on the outside to be inserted. The center of the ball support extension is drilled out for lightness. The steel ball, which is confined in the valve stem extension by means of a retainer, is free to rotate; it comes into direct contact with the cam as the latter rotates, thereby reducing the resistance to the cam action to a minimum. The center of the cam is offset so that when the cam rotates, it will in turn rotate the mushroom and the valve. On the spring washer is placed a worm which engages with the worm wheel on the valve stem forming a micrometer adjustment.



Micrometer valve adjustment for overhead camshaft

22 Tractors Tested Under Nebraska Law

Interesting figures are developed in laboratory use provided in measure to protect farmers in purchase of power implements. Machines fare better in reports of committee of experts than does the advertising literature.

UNFORTUNATE experiences of some farmers in Nebraska in purchase of tractors resulted in a law being passed that all tractors sold in that State must have a certificate from the State Railway Commission, based on tests conducted by the State University, giving them the right to be sold. These tests are under the supervision of a committee from the Agricultural Engineering Department of the State College of Agriculture. The tests are conducted by Claude K. Shedd, who has been retained for the purpose.

The object of the law is to protect the purchaser against fraudulent claims by the manufacturer. To further this, the following tests are made: after a run to limber it up, brake horsepower at rated load and rated speed for ten hours, brake horsepower at load varying from maximum to no load, brake horsepower at maximum load, brake horsepower test at half load for one hour, drawbar horsepower at rated load for ten hours, maximum drawbar horsepower. While no tests to destruction are made, the engineers in charge carefully observe the operation of the machine to detect signs of structural weakness. The reports of each test, as published, cover three pages and an attempt has been made to condense them here. Much data is given in the reports that is of interest only to those who wish to make a detailed study of the performance of some particular machine.

In the table appended will be found the key factors revealed by the tests. An abstract of the comments by the engineers included in the reports is given separately. The excerpts from the catalogs of the manufacturers show that the board has made a careful study of them and that they do not consider hyperbole justified at all. In all cases they state whether or not there were any signs of undue wear or weakness.

Test No. 1—Waterloo Boy, Model N, 12-25 hp. No evidence of undue wear or weakness. The governor on this tractor did not give close regulation of the speed even with the load constant and on varying load the speed regulation was erratic. We do not consider this to be so serious a defect as to disqualify the tractor.

In the advertising literature we find the following statement regarding the horsepower capacity: "It has ample reserve power for prompt utility when needed." We do not approve this statement for the reason that is indefinite and therefore likely to be misleading. We also find in this advertising literature some claims and statements which cannot be directly compared with the results of this test as reported above. It is our opinion that none of these statements or claims are unreasonable or excessive except the following:

Page 2 "Drive internal gear most efficient type—"
Air taken from high level insuring no dust."

Page 5 "Air stack brings air to the carburetor from a high level—no dust."

No. 3—Case 10-18 hp. No evidence of undue wear or

weakness. No unreasonable claims in the advertising literature.

No. 4—Case 15-27 hp. Remarks same as for Test No. 3.

No. 5—Case 22-40 hp. Remarks same as for Test No. 3.

No. 6—Case 10-20 hp. Remarks same as for Test No. 3.

No. 7—Case 20-40 hp. No evidence of undue wear or weakness. In the advertising literature we find the following statement regarding horsepower capacity: "It — developed a liberal reserve power over its rated horsepower." We do not approve this statement for the reason that it is indefinite and therefore likely to be misleading. No other excessive or unreasonable claim.

No. 8—Oil Pull, Model E, 30-60 hp. No evidence of undue wear or weakness. In the advertising literature we find some statements and claims that cannot be directly compared with the results of the test. It is our opinion that none of these statements or claims are unreasonable or excessive except the following, quoted from their general catalog:

Page 6, "And the proper weight, plus proper distribution of weight, gives 100 per cent traction, even under adverse conditions."

Page 8, "— the two cylinder, low speed engines are much better suited to tractor use than any other types now in use—that the former show an advantage of approximately 20 per cent, greater drawbar efficiency."

Page 9, "Its record of .7 lb. kerosene per brake horsepower has not been equaled in public demonstrations by any other kerosene burning tractor, before or since."

"Take any official tests or demonstrations held since 1912 — figure the average on any and all tests and you will find that the Oil Pull not only hold the record for the best average and uniformity, on maximum power developed and low fuel consumption. — but that no tractor has yet demonstrated by consecutive tests its ability to rank second to the Oil Pull."

Page 13, "— Our own and public tests have proved it to be without exception, the most efficient and economical system of oil combustion."

Page 14, "— All air going into the engine must first pass through a patented air cleaner, which removes all dirt and grit."

No. 9—Oil Pull, Model H—16-30. Remarks the same as for Test No. 8.

No. 10—Oil Pull, Model K—12-20. Remarks the same as for Test No. 8.

No. 11—Oil Pull, Model G—20-40. Remarks the same as for Test No. 8.

No. 12—Huber Light Four 12-25. No evidence of undue wear or weakness. The governor on this tractor, if adjusted to give rated speed at rated load, allowed excessive engine speed at light loads. If the governor was adjusted to give rated speed at lighter load then the tractor would not develop its rated horsepower without changing the governor adjustment. In the advertising literature submitted we find some statements and claims

DETAILS OF TRACTORS TESTED OFFICIALLY UNDER NEBRASKA STATE LAW

Belt tests												Drawbar Tests									
No. of Test	Name and Model of Tractor	Test at rated b. hp. (2 hr.)			Varying load test				Maximum b. hp. Test			Half Load Test			Rated Drawbar Load			Maximum Drawbar Load		Oil* Gal.-hr.	
		hp.	r.p.m.	Hp-hr gal.	maximum		minimum		hp.	r.p.m.	Hp-hr gal.	hp.	r.p.m.	Hp-hr gal.	lb.	m.p.h.	Hp-hr gal.	lb.	m.p.h.		
					hp.	r.p.m.	hp.	r.p.m.													
1	Waterloo Boy N-12-25	25.51	771	7.78	25.43	744	0.99	713	25.97	724	6.83	15.02	903	6.25	1982	2.29	4.23	2900	2.07	3 3/4-44	
3	Case 10-18	18.41	1058	6.24	17.78	1003	1.74	1244	18.145	1043	6.60	10.65	1204	7.55	1540	2.35	5.20	1730	2.41	8-40	
4	Case 15-27	27.52	914.5	10.27	27.31	907.5	1.56	993.5	31.23	924.4	9.90	14.30	947.6	8.06	2700	2.19	6.30	3440	2.05	11.5-37	
5	Case 22-40	40.08	856	9.72	39.95	853.5	1.52	926	49.97	867	7.24	23.65	867.4	7.88	4180	2.11	6.13	4965	2.19	20-53	
6	Case 10-20	20.19	911	8.42	20.25	881	1.64	980	22.81	895	8.75	10.72	965	6.41	1904	2.29	6.57	2631	2.18	8.25-30	
7	Case 20-40	40.29	482	5.66	40.48	467.5	1.17	496	42.80	473	5.57	20.57	494	4.43	3987	2.02	3.885	5537	1.67	12.75-40	
8	Oil Pull "E" 30-60	60.20	375	7.79	60.43	373.5	1.75	420.5	75.60	378	7.05	32.69	406	6.99	5509	1.90	4.28	10025	1.87	9-35	
9	Oil Pull "H" 16-30	30.50	532	9.94	30.83	528.5	1.31	567.5	33.52	537	5.62	15.93	553	8.06	3036	2.06	6.27	4674	1.84	7-35	
10	Oil Pull "K" 12-20	20.06	564	10.82	21.00	560.5	1.31	587	25.87	566	7.96	10.29	576	8.53	2399	2.10	5.41	2780	2.02	5-44	
11	Oil Pull "G" 20-40	39.90	462	9.30	41.56	458.5	1.47	482.5	46.19	465	8.10	20.58	475	9.04	3913	2.00	4.56	6365	1.77	9.5-36	
12	Huber Light Four 12-25	25.28	1003	6.08	25.43	1000.9	1.99	1286	25.70	1005	5.77	12.74	998	7.30	1976	2.86	4.37	2505	2.50	8.25-45	
13	Minneapolis 12-25	25.10	748	6.71	23.73	752	1.67	943	26.24	760	6.20	14.56	852	7.535	2150	2.15	3.80	2842	2.14	6-32.5	
14	Minneapolis 22-44	44.15	705	7.40	44.82	701.5	1.60	746	46.04	701	6.83	23.17	731	8.62	3523	2.70	4.60	5104	2.44	6.5-33	
16	Heider "C" 12-20	20.18	902	6.81	21.11	885	1.18	885	24.24	902	5.59	10.10	897	4.24	2135	2.32	1.35	2223	2.26	2.25-36	
17	Heider "D" 9-16	15.96	1001	7.32	16.34	988	1.10	1002.5	19.54	1003	6.75	8.03	1006	4.96	1472	2.52	4.53	1900	2.32	4 3/4-33	
19	Twin City 12-20	20.32	1009	6.88	20.90	1003.5	1.03	1077	27.93	1017	8.77	10.90	1051	5.64	1772	2.93	5.005	2061	2.92	3-32	
21	Wisconsin "E" 16-30	30.24	901	5.455	30.18	902	1.26	986	31.50	914	5.58	15.82	936	6.04	2500	2.34	2.90	3426	2.43	3-34	
24	International 15-30	30.73	580	6.88	30.80	564	1.35	641	36.98	577	5.07	17.10	632	5.50	2405	2.47	3.08	4990	1.65	5.5-31	
25	I. H. C. 8-16	16.06	1007	7.32	16.26	1002	0.84	1083	18.52	1007	5.71	8.47	1060	5.27	1120	2.71	3.19	2588	1.59	4.75-32	
26	Hart Parr "30"	30.22	755	8.04	30.53	747	1.32	811.5	31.37	756	6.62	15.98	793	7.45	2073	2.78	4.74	3494	1.67	2-30	
27	Samson "M"	17.29	1111	7.46	17.59	1100	0.79	1215	19.39	1111	6.94	8.67	1109	5.51	1252	2.94	4.32	1950	1.77	9.75-37	
30	Aultman-Taylor 30-60	60.29	553	8.71	64.73	532	2.13	584.5	80.10	556	8.80	37.00	591	6.53	5184	2.54	4.97	9160	2.38	17.25-44	
32	Aultman-Taylor 22-45	44.92	600	8.38	45.53	602.5	2.44	720	46.66	607	7.49	26.97	713	6.51	3723	2.46	5.92	4986	2.11	16.75-36	

*In engine only. The reports give kind of oil and amount used in transmission.

which cannot be directly compared with the results of this test. In our opinion none of these statements or claims are unreasonable or excessive:

"The Huber is positively the last word in economical transmission power."

"— practically every ounce of power generated in the motor is delivered direct to the load on either belt or traction."

No. 13—Minneapolis, 12-25. No evidence of undue wear or weakness. No unreasonable claims in the advertising literature.

No. 14—Minneapolis, 22-44. No evidence of undue wear or weakness. No unreasonable claims in the advertising literature.

No. 16—Heider Model C, 12-20. No evidence of undue wear or weakness. In the advertising literature we find the following statements regarding horsepower capacity: "— and it has, besides, plenty of reserve power for emergency." We do not approve this statement for the reason that it is indefinite and therefore likely to be misleading.

We also find some statements and claims which cannot be directly compared with the results of this test. It is our opinion that none of these statements or claims are unreasonable or excessive, except the following:

Page 3, "The Heider tractor — is equally efficient, equally economical, on either light or heavy work." "Is a real, all-purpose tractor—. The man who owns one needs no other power."

Page 5, "Under all conditions and in all competitive tests, it has proved its superiority beyond all question."

Page 9, "And when burning kerosene, Heider burns it all."

Page 23, "Both of the Heiders are equipped with the famous four-cylinder, heavy work Waukesha motor, which has proved to be the best power plant for tractor service."

No. 17—Heider Model D, 9-16. Remarks the same as in Test No. 16, with the addition of the following: The catalog statements referred to are made with specific reference to the Heider Model C, 12-20, but it evidently is intended to make the same claims for the Model D, 9-16, since on page 18 it is stated that "It (the Model D)

is — an exact duplicate of Model C, 12-20, except for size."

No. 19—Twin City, 12-20. No evidence of undue wear or weakness. In the advertising literature we find the following claims regarding power capacity. "— Engine actually develops power far beyond its rating." "— great surplus of power." These claims are not approved for the reason that they are indefinite. We also find in this advertising literature some statements and claims which cannot be directly compared with the results of this test. It is our opinion that none of these statements or claims are unreasonable or excessive except the following: "— not only — efficiently burning kerosene but — transforming all of it into power."

No. 21—Wisconsin Model E, 16-30. No evidence of undue wear or weakness. In the advertising literature submitted we find some statements and claims which cannot directly be compared with the results of this test. It is our opinion that none of these statements or claims are unreasonable or excessive except the following:

Page 6, "Because of this simplicity, for which all tractor manufacturers have been striving unsuccessfully, the Wisconsin Farm Tractor is most desirable for the average farmer."

Page 7, "The cooling system of the Wisconsin Farm Tractor is the most compact, simple and efficient type made."

Pages 12 and 17, Lubrication. "—full pressure system." (The piston and wrist pins are lubricated by throwing off from crank bearings and therefore it should not be called a full pressure system.)

Page 13, "By breaking up and gasifying the raw fuel we insure complete combustion—."

Page 13-17, "Air or water cleaner — prevents the possibility of any dirt or grit entering the engine cylinders. —."

Page 18, "Operator can control tractor with one lever under any condition—."

Page 22, "This type of (rear axle) construction is much superior to the split axle type of rear axle shaft —." (The University Board of Engineers is not convinced that the superiority of this type has been proven.

Page 31, "Pulls three or four plows under all conditions." (We would approve a three or four-plow rating for this tractor but believe that there are some extreme conditions under which it would not pull three plows.)

No. 24—International 15-30. No evidence of undue wear or weakness. In the advertising literature submitted we find some statements and claims which cannot be directly compared with the results of this test. It is our opinion that none of these statements or claims are unreasonable or excessive except the following:

"The facts are that—the International 15-30 will pull as many plows as any other tractor of equal rating." (We do not approve this statement for the reason that authentic information is not available at the present time in the capacity of some of the tractors included in this comparison.)

"The engine—is of the valve-in-head construction, which is best for farm work." (We do not approve this statement for the reason that proof is lacking.) "Kerosene mixer cuts fuel bills in two."

"The air intake is above the dust zone. This insures clean air at all times."

"Throttle governor maintains uniform speed." (The speed regulation under test was good but not absolutely uniform.)

"This form of drive (chain and sprockets) has proven through repeated experiments to be most satisfactory." (We do not approve this statement for the reason that proof is lacking.)

No. 25—L. H. C. 8-16. No evidence of undue wear or weakness. In the advertising literature submitted we find some statements and claims which cannot be directly compared with the results of this test: "Fly-ball throttle governor—keeps the speed of the engine uniform." (The speed regulation was good in this test; but the speed was not absolutely uniform.)

"The valve-in-head engine is most practical for farm purposes." This statement is not approved for the reason that proof is lacking.

No. 26—Hart-Parr 30. No evidence of undue wear or weakness. In the advertising literature submitted we find no statements and claims that are unreasonable or excessive.

No. 27—Samson Model M. No evidence of undue wear or weakness. In the advertising literature submitted we find some statements and claims that cannot be directly compared with the results of this test. It is our opinion that none of these statements or claims are unreason-

able or excessive except the following:

"The Model M is capable of pulling 2 14-in. plows at all times and three 14-in. plows under favorable conditions." (We would approve a two- or three-plow rating for this tractor, but believe that there are some extreme conditions under which it would not pull two plows.)

"Even distribution of weight, compact design, and low center of gravity give to the Samson perfect traction —." "— Is provided with a perfect governor —."

No. 30—Aultman-Taylor 30-60. No evidence of undue wear or weakness. In the advertising literature submitted we find some statements and claims which cannot be directly compared with the results of these tests. It is our opinion that none of these statements or claims are unreasonable or excessive except the following:

"We guarantee this tractor to move more cubic feet of earth in a given length of time with less fuel and less maintenance cost, using the same tools, working under the same conditions than any other make of tractor regardless of its size and rating."

"— It is still first in the large tractor field because no other tractor can produce a similar record for faithful, economical performance over a period of ten or more years."

"In fact they (22-45 and 30-60) have established records for power and economy that have never even been closely approached by any other tractor."

"We can safely say that they are the best designed and best built tractor motors used on any heavy duty tractor."

(We do not approve the comparisons with other tractors quoted above for the reason that proof is lacking.)

No. 32—Aultman-Taylor 22-45. No evidence of undue wear or weakness. In the advertising literature submitted we find some statements and claims which cannot be directly compared with the results of this test. It is our opinion that none of these statements or claims are unreasonable or excessive except the following.

"In fact they (22-45 and 30-60) have established records for power and economy that have never even been closely approached by any other tractor."

"We can safely say that our tractors are free from any transmission troubles."

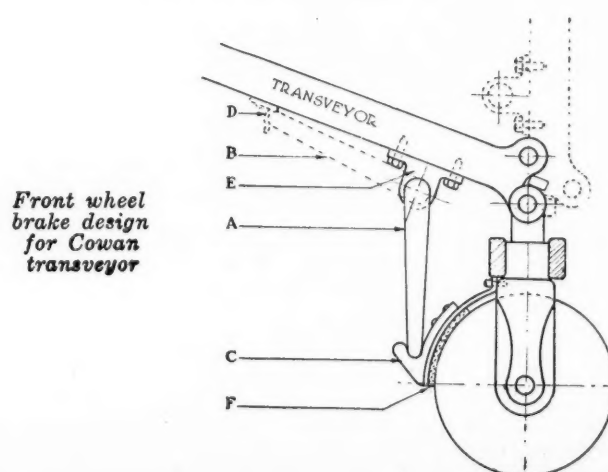
"We can safely say that they are the best designed and best built tractor motors built on any heavy-duty tractors."

(We do not approve the comparisons with other tractors quoted above for the reason that proof is lacking.)

Brake Attachment for Transveyor Trucks

THE accompanying drawing illustrates a brake attachment for the Cowan transveyor lift truck designed to ease heavy loads down inclines. Referring to the illustration, A is a pendant swinging from the bracket E on the transveyor handle and, when it is desired to apply the brake, this pendant is allowed to engage in the casting C which is fastened to a strip of spring steel lined with Raybestos at F. The heavier the operator bears on the handle the greater is the braking effect. When use of the brake is not desired, the pendant A is swung up out of the way, as shown in the dotted position B, and is held to the handle by the spring clip D.

A PAMPHLET being distributed by the National Tube Co., under the title, "Anti-Corrosion Engineering," discusses a practical method for preventing the destruction of steam and hot water pipes.



Truck Chassis Much Used for English Provincial Buses—IV

Standard of design demanded to meet the London conditions are not carried out beyond jurisdiction of licensing authorities. Practically all manufacturers make certain modifications of commercial design to meet requirements of quietness. Worm gear often substituted for other forms.

By M. W. Bourdon*

MOTOR bus chassis and bodies intended for use outside the area in which the London licensing authorities hold sway are not obliged to comply with such precise rules and regulations as are applicable to buses used in the metropolitan area. The various municipal and county licensing committees impose, generally speaking, no limitations of their own making, merely insuring that in maximum weight and width the complete vehicles accord with the national regulations applying to heavy commercial vehicles irrespective of their superstructure or purpose.

Thus the makers of provincial motor buses have an almost free hand in design, so long as they provide a complete vehicle weighing not more than 11,200 lb. unladen (London max., 7840 lb.) and of no greater width than 90 in. As a result they are able to sell both single and double deck buses which for many reasons would fail to obtain license in London. They have no standards of silence, cleanliness (freedom from oil drippings), stability, spring centers and other features to consider, beyond those set by themselves or by their prospective customers. One result of this freedom is the general use of spur gears in the transmission, instead of the silent chains necessitated in London, and the adoption in some cases of either straight bevels or double reduction gears (bevels and spur pinions) for the final drive. In isolated instances roller chains form the final drive, a system which has been ruled out by the London bus companies for many years past.

Provincial motor buses are supplied by the Associated Equipment Co.—the makers of the buses used by the London General Omnibus Co.—and by Tilling-Stevens, Ltd., who construct the London gasoline-electrics. But both these firms depart from the design necessitated for London use and supply for public services chassis which are also sold with truck bodies to industrial concerns. Automobile manufacturers who are primarily truck makers also supply provincial buses in large numbers, they, too, selling what is after all merely a modification of their standard $2\frac{1}{2}$ to 3 or 3 to 4-truck chassis. In some cases no modifications are in evidence at all; in others, merely a lengthened wheelbase is supplied; while in a few cases the final drive is varied, worm gearing being substituted for either bevel or double reduction gears.

But despite this use of practically a standard truck chassis for provincial buses, the vehicles provide satisfactory service in passenger transport. At the same time it is probable that the greater weight of provincial buses as compared with the latest types in use in London has the effect of increasing operating costs unnecessarily.

*Mr. Bourdon is engineering correspondent of AUTOMOTIVE INDUSTRIES in the United Kingdom.

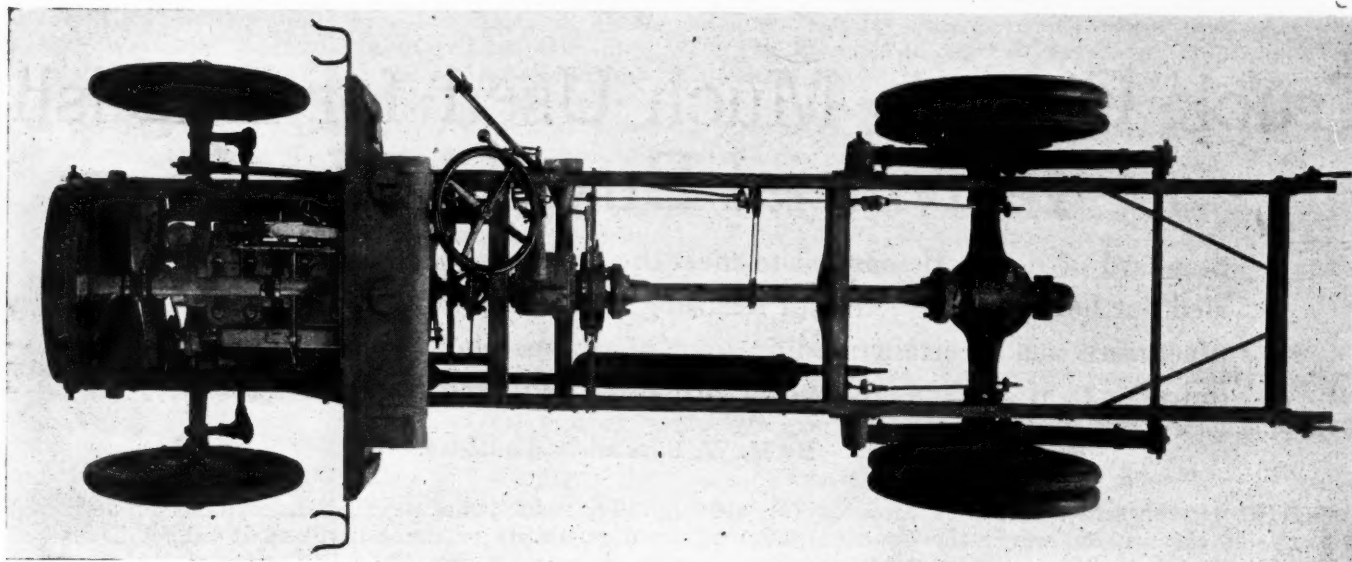
ily. The reduction of weight in London has not detracted from reliability or durability, and it cannot be denied that the engines of vehicles in provincial use are called upon to propel an unnecessary amount of dead load, aggregating 2000-3000 lb. in some cases. Provincial use is no more severe than London service, unless it be in respect of a frequent lack of proper supervision and organization for periodical overhaul and repair. London buses operate on roads quite as rough surfaced and as hard on the chassis and bodywork as do the vehicles in provincial use, the main differences in the latter service being the more numerous hills, the longer and steeper gradients and the greater number of miles run on road surfaces other than asphalt, wood paving and cobble stones.

A large number of provincial bus routes run through rural districts in passing from one center of population to another, or in the course of a long out-and-home journey from town or city headquarters. Overhanging trees, overhead telegraph wires, excessively cambered roads, "donkey-back" bridges and other factors have therefore very largely ruled out the use of double-deck bodies, and it is, perhaps, more in the matter of alternative bodywork than in chassis design that post-war developments has occurred in this type of vehicle.

Dealing in the first instance with chassis detail and taking half a dozen representative designs, the following general particulars apply to the British provincial bus:

Engine—Four cylinders cast in pairs are universal, but the L head and T head designs are equally in favor. Bore and stroke vary from $4\frac{1}{2}$ x $5\frac{1}{2}$ to $4\frac{5}{8}$ x $6\frac{1}{4}$ in., the most favored dimensions being $4\frac{1}{2}$ x 6 in., though there is one example of 5 x 6 in. The normal engine speed is 1000 r.p.m., and although in most cases a governor is fitted as standard to cut out at that speed, that form of control is nearly always put out of action by users and the engine is speeded up to 1600-1800 r.p.m. very frequently. The maximum b.h.p. is 40, usually attained at 1200 to 1300 r.p.m.

Valves are nearly always inclosed and the camshafts are operated by straight toothed timing gears. Pump circulation for the water is general, as are vertical gilled tube radiators with cast top and bottom tanks, aluminum being most frequently used. The crank case is also of aluminum, the crankshaft being supported in three white metal bearings from the top half, the lower half forming only the oil sump and carrying the troughs for the usual splash system of lubrication. In connection with the latter a gear type oil pump is general and is nearly always located in the sump and driven by skew gears and a vertical shaft from the camshaft.



Thornycroft bus chassis, using fabric disk joints at each end of long, uninclosed hollow shaft

Magneto ignition is standard, and with few exceptions fuel is fed by gravity from a dashboard tank, the vacuum system being almost unknown in this type of chassis.

Cast-iron pistons are universal, generally with four rings in the head; piston pins are fixed in the bosses of the pistons.

Clutch and Gear Set—The external cone type of clutch with leather or fabric facing is general, but, while in some cases the male member is of cast steel, in an equal number it is of pressed steel. Direct acting clutch throw-out mechanism through a ball thrust ring is very prevalent, and although this tends toward simplicity it has the effect of making clutch pedal operation very heavy—much heavier than should be the case in view of the frequent changes of gear ratio called for with a public service vehicle, from 600 to 1000 per day in provincial use.

Between clutch and gearset the coupling shaft generally has two flexible disk joints to allow for frame distortion, for the engine and gear set are usually supported direct from the side members and from cross members respectively; they are, it will be realized, invariably separate units.

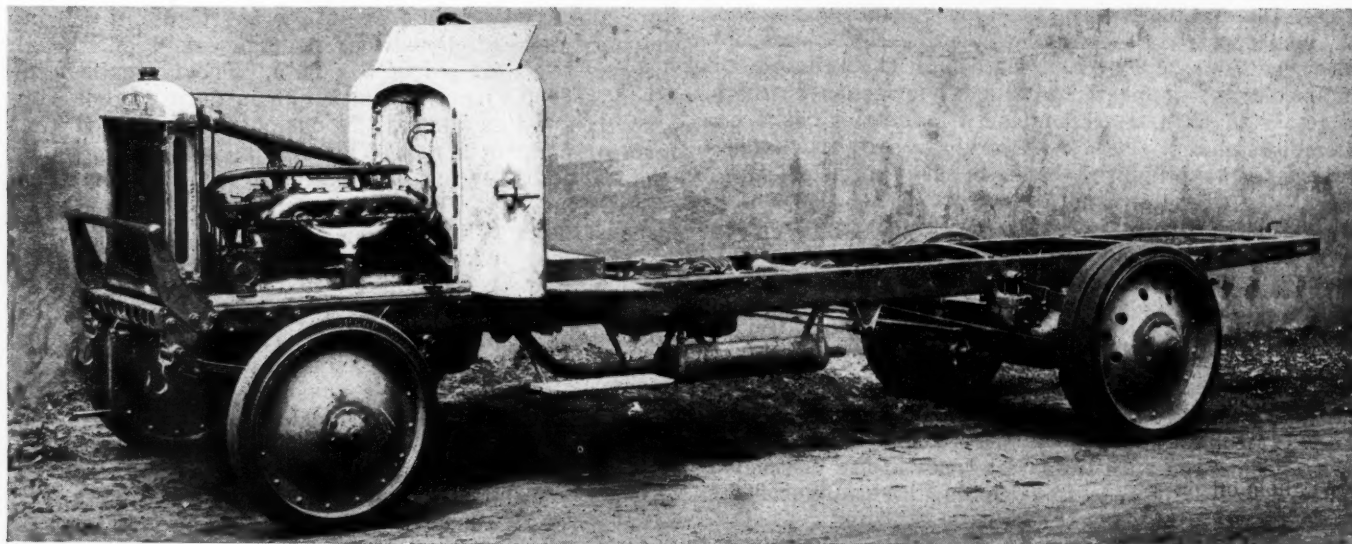
Four speeds with selector change are general (as opposed to three in the London buses), with the usual

straight toothed pinions for the indirect ratios; ball bearings are used with castellated shafts, while the casing is as frequently of cast iron as of aluminum.

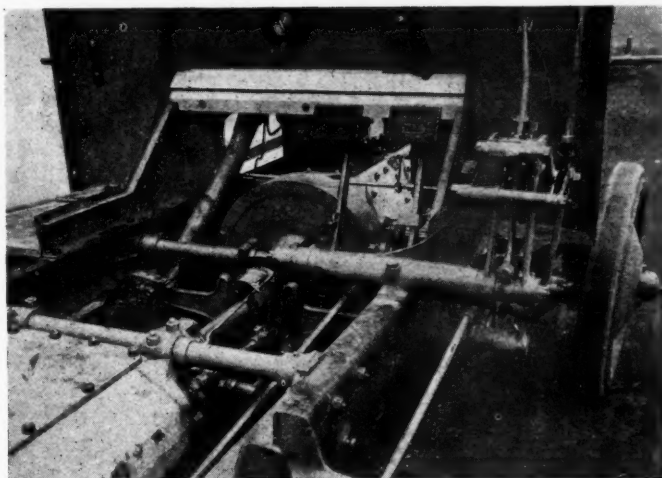
Transmission, Rear Axle and Brakes—Propeller shafts are of both open and inclosed types; in the former case the rear springs take torque and thrust. In the Dennis design—a popular and widely used make—there is an exposed intermediate shaft, coupled to the gear shaft by a plain bearing star-type universal and similarly connected to the comparatively short inclosed propeller shaft. The casing of the latter has a spherical head anchored in a socket attached to a cross frame member, a special feature of the latter being that it is supported at each side by inclosed rubber trunnions which take thrust and torque and allow a certain degree of flexibility.

Universal joints for the propeller shaft are generally of the star type with plain bronze bearings, but in the Thornycroft—another popular chassis for provincial bus work—fabric disk joints are used at each end of the long uninclosed and hollow shaft.

Worm drive, with the straight worm over the wheel, predominates in rear axles, and it is in this detail among a few others wherein the truck makers' standard chassis is varied for omnibus use. Leyland, for example, expresses pronounced preference for a double reduction



Leyland chassis in which worm gearing is supplied for buses in place of the double reduction for trucks



Clutch and clutch striking gear in Leyland chassis

rear axle drive for trucks, and yet supplies worm gearing for bus chassis. Obviously the reason is the quieter operation of the worm. No maker of 'bus chassis has yet attempted to adopt helical bevels for the final drive, probably owing to the fact that the necessarily large diameter of the crown wheel to obtain the full reduction in shaft speed would compel the use of a much larger and heavier axle casing, thus increasing the unsprung weight and decreasing the ground clearance. The final drive ratio usually varies from 7.25 to 8.25 to 1, for, although the legal limit of speed is 12 m.p.h., this is ignored by designers, who calculate on about 16 m.p.h. at the normal 1000 r.p.m.

Ball journal and thrust bearings are almost invariably used, in preference to the roller type, in the axle center, but the wheels are rarely run on other than drilled plain bushings, floating on the ends of the axle casing extensions. As compared with the axle of the "K" type London bus chassis, the modified truck chassis for provincial bus use has an axle of considerably greater weight—probably as 2 to 1. It is made up of steel castings; generally there are four of these components, consisting of (1) the center piece, (2) the cover plate, which often supports the bearing housings of worm, worm wheel and differential, and (3) and (4) the spring brackets and wheel bearing extensions bolted to the outer vertical flanges of the center piece.

The drive from the differential to the wheels occurs either through dog clutch plates on the castellated outer ends of the axle shafts, or, as in the case of the Dennis, through the hub cap, the latter being bolted to an outer flange on the wheel hub and fitting on to the castellated end of the shaft.

Both sets of brakes are never applied to the rear wheel

drums, as in the case of the London "K" type bus. Internally expanding shoes, hand-operated, take effect directly in that way; but the pedal brake system consists of contracting shoes applying to a drum behind the gearset, a fact which doubtless accounts partly for the greater dimensions and weight of the rear axle and final drive, owing to the need for providing against the excessive stresses of breaking through worm gear, differential pinions and drive shafts. But a transmission brake is a standard feature of British truck chassis, and it has been continued for provincial buses.

Steering, Frame and Wheels—The usual steering gear is of the worm and sector type with ball joints on the thrust rod; but there is no standard practice in either respect, for the joints are sometimes of the link pattern and the gearing by worm and nut.

There is, however, universal practice in regard to frame construction, and the stamped steel variety is used by all; even the A. E. C. for provincial buses has stamped steel frame members as compared with the fitch plate and ash frame of the London "K" type bus made in the same plant.

Wheels are of both the cast steel and disk types, the former being made with either tubular or webbed spokes. Disk wheels have not, however, proved entirely satisfactory, and there is distinct preference for the cast steel type, owing to the absence of rivets to work loose—the principal fault in the alternative pattern, despite various arrangements and shapes of disks aiming at the elimination of this weakness. In diameter, wheels are from 40 to 42 in. with solid band tires, twin at the rear and singles in front. Giant pneumatics are appearing experimentally on provincial bus routes, but they are few and far between as yet.

In regard to weight, the average provincial 'bus chassis is some 2000-3000 lb. heavier than the latest London type; it is variously stated by the makers as weighing from 6700 lb. to 7300 lb., but when it gets on the scales there is not much balance over from 7500 lb.—which corresponds with the 5250 lb. of the London chassis. There is no good reason, as already suggested, why there should be this difference—except and only the stringent regulations in the metropolitan area, which have compelled specialized design and weight reduction.

General dimensions of provincial bus chassis may be summarized as follows:

Wheel base	170 to 190 in.
Track	65 " 67 in.
Overall length of chassis	360 " 300 in.
Ground clearance	10 " 12 in.

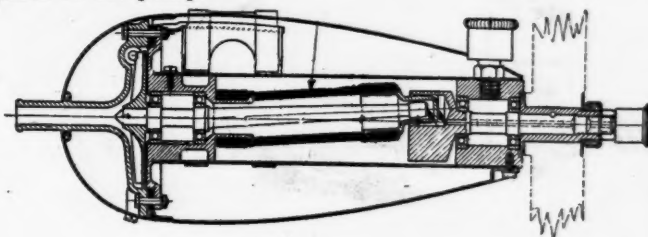
There is a very wide difference in the type, design and seating capacity of provincial 'bus bodies, but consideration of these must be left over to a future occasion.

New Glandless Petrol Pump

THE leaking of fuel pumps in aircraft is always a source of danger from fire as well as the deterioration of the fabric from gasoline soaking. Most of this leaking is due to the glands as gasoline is more difficult to retain than water.

A pump which has no glands has been produced by the Austin Motor Co. The pump proper is a centrifugal impeller type. On the end of the propeller shaft is a disk with a hole off center. In this hole fits a thimble attached to a length of gasoline resisting hose. Inside the thimble is the end of an angle arm attached to the pump impeller. The hose is attached at the other end to the frame. The

hose does not rotate but merely bends. Thus there is no direct connection between the driving end and the driven parts of the pump.



Effects of Changes in Mixture Ratio and Inlet Temperature

This Is an Abstract of the Paper Read by the Author at the Summer Meeting of the S. A. E.—It Shows That from 10 to 50 Per Cent Saving Can Be Accomplished by Correct Adjustments of the Carbureter to Meet Conditions—If This Were Done There Would Be Less Talk of a Gasoline Famine.

By W. E. Lay*

IN the effort to conserve motor fuel during the war an article was published in which the statement was made that 470,000 gal. of gasoline was wasted every day as a result of leaky and badly adjusted carbureters. In the spring of 1918 some investigations were made at the University of Michigan regarding the effect of varying mixture ratios on the thermal efficiency and the torque of an engine operating under different conditions of speed, power output and temperature of the fuel-intake system.

The object of the first series was to determine whether the mixture giving the best economy and that giving the greatest power are constant for all conditions of speed and power output of the engine. The object of the second series was to determine what effect any changes in the temperature of the fuel-intake system have on the quality

*Assistant professor of mechanical engineering in charge of automotive engineering, University of Michigan.

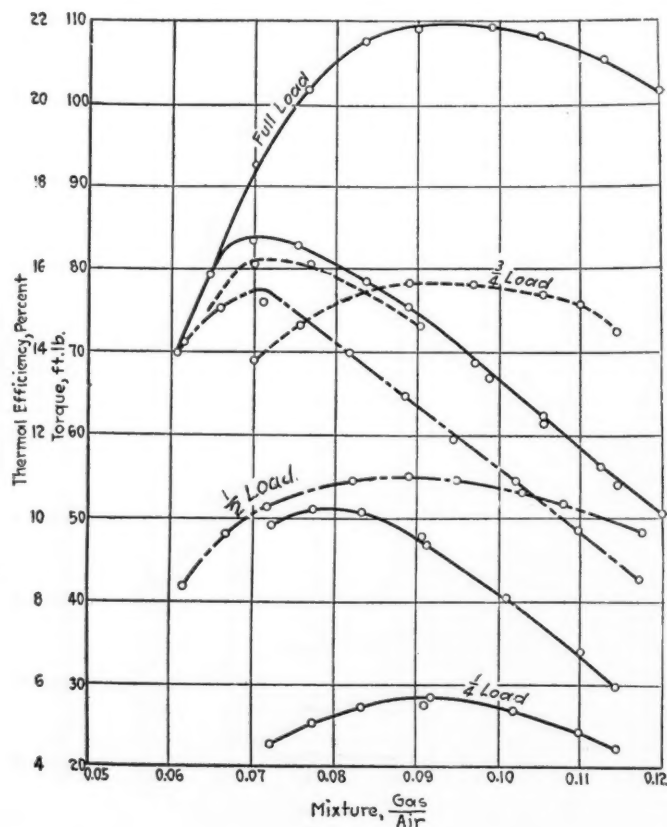


Fig. 1

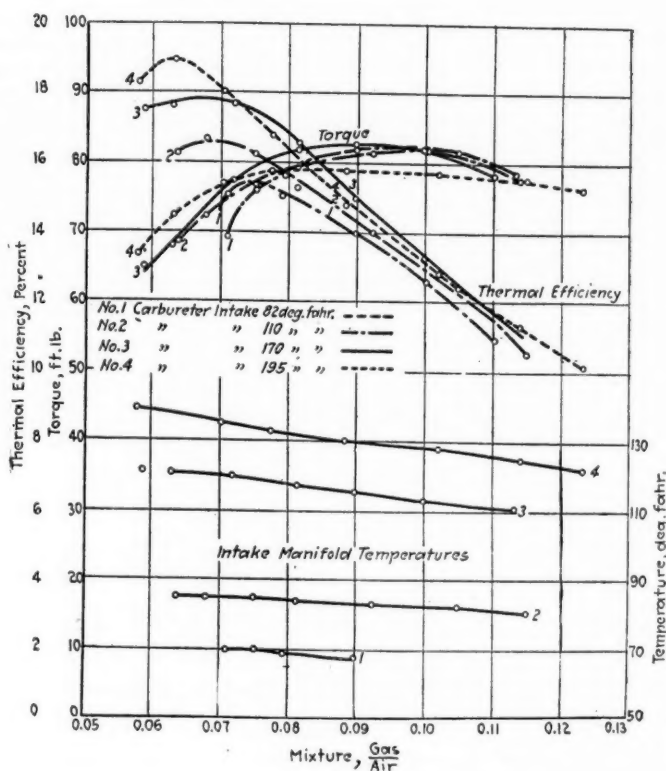


Fig. 2

of the mixture which gives the maximum power and that giving the best economy. The tests were conducted on the four-cylinder engine used in the standard Government ambulance.

By trial the needle-valve of the primary fuel-jet was adjusted to the position of maximum power for the desired speed and power output. The throttle and the spark were then fixed and the operating conditions of the engine maintained steady and constant while the fuel-consumption and torque determinations were made with various needle-valve positions.

The results of the first series were plotted on curve sheets (see Fig. 1), using the ratio by weight of gasoline to air in the mixture as abscissas and torque and thermal efficiency as ordinates. A study of the curve sheets brings out the following points:

1. The mixture quality giving the greatest power is very different from that giving the best economy. The engine uses approximately 25 per cent more gasoline per brake-horsepower-hour when running on the quality of

mixture giving the greatest power output than on the most economical mixture.

2. The mixture giving the maximum economy becomes somewhat leaner as the power output is increased.

The results of the second series which were plotted in a similar manner (see Fig. 2) were obtained by changes of the temperature of the air entering the carbureter instead of the engine output. From these results the following conclusions can be drawn:

1. Over the temperature range investigated an increase in the carbureter-intake temperature means an increase in the thermal efficiency.

2. The mixture giving the best economy at a high temperature is a leaner mixture than that giving the best economy at a lower temperature.

Thus, though the carbureter will operate perfectly with the throttle nearly closed, and also if gradually shifted to the wide-open position, it will not operate satisfactorily after a quick change. It is obvious that the operation during acceleration can be improved in two ways: by holding back the air or by pumping in more gasoline momentarily until the carbureter has adjusted itself to the new conditions.

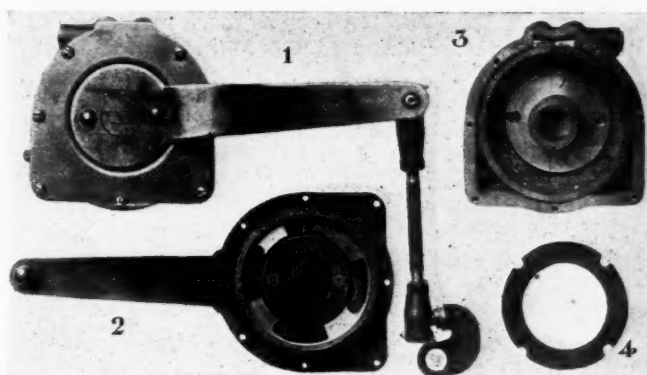
The conditions under which a carbureter must operate can then be summarized as follows:

Those requiring a richer mixture are: a cold engine, hill climbing, high speed and quick acceleration, with the throttle wide open. The condition for maximum economy requiring a lean mixture is continued operation with engine well warmed up.

Shock Absorber for Rebound Only

THE problem of damping the oscillations of the springs on motor vehicles has received a great deal of attention from engineers. The general solution has been to provide a means for absorbing the energy of the shocks or road impacts. Some of these devices exert a damping action only during the rebound of the spring, while others act equally during compression and rebound. A shock absorber of the first mentioned type has been evolved by the Hinsman Machine & Tool Co. This device does not retard or reduce the compression of the springs when the wheel strikes a road obstruction but prevents a violent rebound, allowing the body to slowly rise to the normal height over the axle.

The device consists of a friction ring which acts on a drum that can rotate freely in one direction, rotation in the other direction being stopped by a set of pawls. The small plate attached to the bottom of the coupling rod shown in Fig. 1 is attached to the under side of the spring clip bolt. The coupling itself has ball and socket joints at each end. Fig. 2 shows the cover plate, pawls and friction drum removed from the housing. The friction ring, Fig. 3, is shown in place in the housing. At the right of Fig. 3 is shown the end of the screw that acts on the base of a spring inside the top of the housing. This spring acts on a piece bearing on one side of the split part of the friction ring. By this means the friction is adjusted. Also, upon



Hinsman shock absorber for rebound only

removing the screw the necessary grease may be put in. The washer, Fig. 4, covers the pawls and keeps them in place.

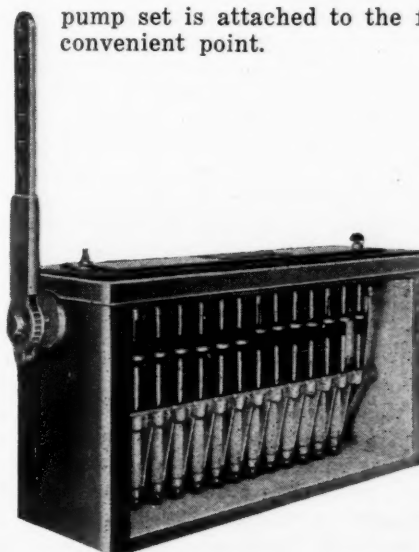
The action is as follows: When the spring is compressing the pawls slip over the gear teeth, and no resistance to the spring action is offered. When the spring rebounds the pawls engage and the friction drum is rotated within the friction ring, absorbing the energy stored up in the spring. All parts are of rugged construction and a gasket under the cover keeps out dust and grit.

Romon Automatic Chassis Lubricator

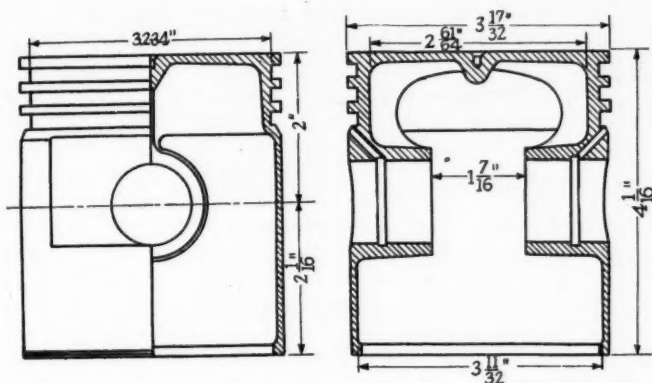
THE inconvenience of having to fill and turn up grease cups periodically has led many inventors to look for some means to obviate it. It is claimed that grease is a poor lubricating medium as it tends to clog up the passages with dirt and prevent fresh lubricant from reaching the bearing surfaces.

An attempt to obviate all this is embodied in the Romon automatic chassis lubricator. It consists of a tank containing fourteen pumps and piping from them to the various points in the chassis. Each pump consists of a cylinder and a piston actuated by a cam and return spring. The camshaft is operated by a hand lever acting through a pawl and ratchet. Every week this lever is given a reciprocating motion by hand for five or six seconds, and the oil is driven under pressure to the bearing surfaces. There is a ball check valve at each pump and one at the delivery point. By this means the line is kept full of oil under pressure and the oil can only leak out through the bearing. Where the bearing to be lubricated moves in relation to the supply line, a swivel connection is used. The central tank and

pump set is attached to the frame at some convenient point.



Romon chassis lubricator



Gray iron pistons used in the Hudson super-six car. This piston has a clearance of .0035 in. after running in. The maximum weight of the piston is 2 lb. 3 oz. It has a diameter of $3 \frac{17}{32}$ in. and a length of $4 \frac{1}{16}$ in.

or three years ago. At the same time, nothing has been done as yet to entirely overcome the difference in expansion between iron and aluminum. Theoretically, if the cylinders were aluminum and the pistons cast iron, the expansion of the two metals would be about the right proportion, both when the parts were hot and when they were cooled off. With the aluminum pistons and cast iron cylinders, the difference in expansion is not in the right direction."

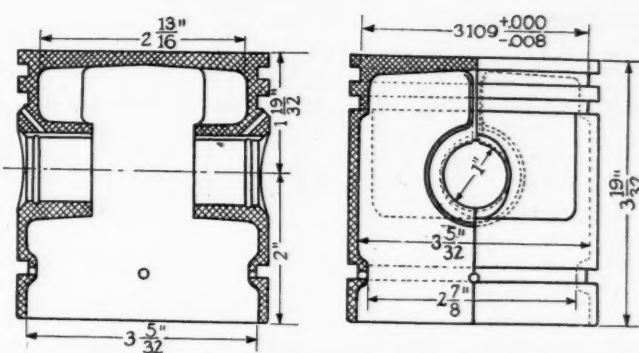
Another objection which one frequently encounters among those opposed to the aluminum piston is the fact that they are having difficulty in securing uniform castings. Some of these state that the castings vary so that no two can be machined with the same feed, speed or cutting tools. Another objection along this same line is that the pistons are apt to warp after being used for a while. Several state that they have found abnormal wear of the ring grooves, particularly with low grade fuel, in cold weather.

Many Favor Aluminum Piston

While it is true that, if we were to take a vote among engineers on the subject, it would be adverse to aluminum pistons as at present developed, there are so many good engineers who are in favor of them and who are having success with them that one is inclined to believe that those opposed have not worked out their problems correctly.

As one engineer expresses it: "We have now running 130,000 automobiles of our make equipped with aluminum pistons, and we are using them in spite of the fact that they cost three times as much as cast iron."

Another says: "Aluminum pistons such as we are using on our car are giving very good satisfaction, and we have no intention of discontinuing. At the beginning, before



Piston used in the Essex car made of Lynite aluminum alloys. This piston has a maximum weight of $13 \frac{1}{2}$ oz. and has a diameter of $3 \frac{1}{2}$ in. and a length of $3 \frac{19}{32}$ in.

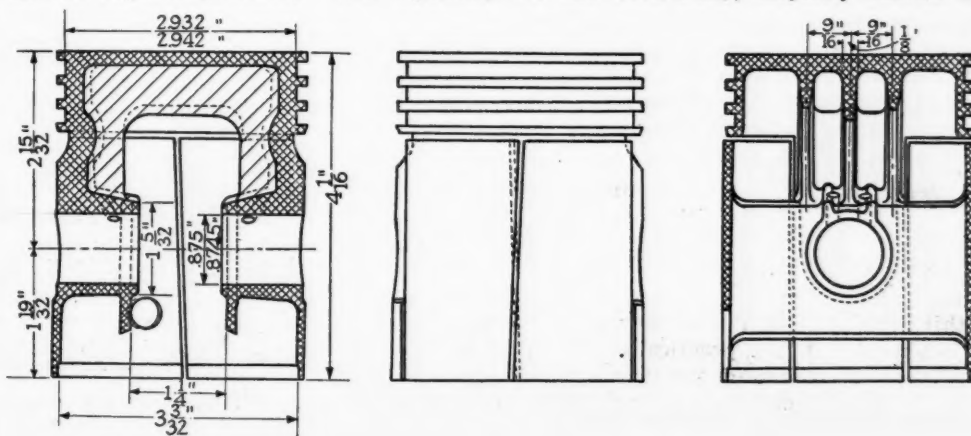
the pistons were furnished to us of the proper hardness and properly heat treated, we experienced trouble. Aluminum pistons are the most practical solution for the high speed engine, and the extremely light weight, cast iron pistons, so far as we know, have not been developed to the point where they can be relied upon for quantity production."

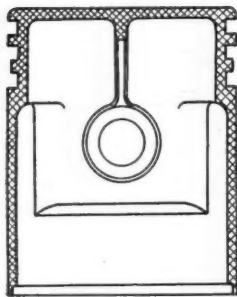
In other words, this engineer comes back at the iron piston by stating that the light section pistons which have recently been developed are not giving satisfaction. Many of the engineers using aluminum pistons are looking for even better piston material in the future. That is, they are looking for improved aluminum alloys, which will do away with all possible objections.

For the air-cooled car which, in order to meet air-cooling requirements, must be of small bore anyway, the aluminum piston has a great many advantages which cannot be duplicated by other pistons. An engineer connected with a firm making air-cooled cars states: "One of the advantages in our case is the rapid conduction of heat from the pistons into the cooling medium. We believe that in the majority of instances it would be necessary to use some type of compressible piston which can be made to start out with initial clearance, the same as that which would be allowed for cast iron pistons. We believe that under similar conditions, the wear of piston and cylinders is less with aluminum than with cast iron pistons."

Even among those who use the aluminum piston, the question of wear proves to be somewhat of a problem. One manufacturer of high-priced cars states that aluminum pistons are desirable in cases of highly refined cars which go to a high-priced market where cost of repair and upkeep is not of serious importance. He states that these pistons wear the cylinders out rapidly, but save the bearings considerably, but since cylinders are far more expensive to replace, the balance is in favor of the cast iron piston, especially for the work-a-day, majority market car,

Another Franklin aluminum piston design





Sectional view of Oakland piston with connecting rod assembly. There are over 300,000 of these in service and the Oakland engineers report excellent satisfaction

where long life is of prime importance. However, to secure the best possible running and performing car, the aluminum piston is favored.

Aluminum Housings

As regards housings, practically all engineers favor aluminum castings for crankcases, and not a few for axle housings, although the opinion is that pressed steel is coming in very strongly for this latter purpose. Most of those who do not use aluminum crankcases are compelled to use iron because of its cheapness, or are casting the crankcase in a unit with the cylinder block. The use of aluminum for differential carriers and for other supporting parts not highly stressed is generally favored.

Aluminum Forgings

While the aluminum forging has been under examination for about a year, little or nothing that is definite can be learned about it as yet. Engineers are inclined to be skeptical regarding its immediate use. So far the product has been examined only in an experimental way. Cast aluminum rods were tried some time ago by one concern, and it was found that these rods, which were employed on a small bore, high speed eight-cylinder engine, were satisfactory for strength. However, the heat developed during a full power run expanded the rods to such an extent that loss of oil pressure resulted. The engineers of this concern do not see how forged rods would be any better in this respect, even though bushings are used. In other words, it is believed that it will be difficult to keep the rods tight on the bearings.

A prominent manufacturer of air-cooled cars, who makes a point of lightness, has been experimenting considerably with forged aluminum rods, and to-date has not had any failure of such rods. The engineer of this concern states: "We do feel, however, that it will be necessary to operate these rods directly on a pack-hardened crankshaft, or at least on a crankshaft which will have a very high Brinell reading. We think probably the reading should not be lower than 300 to 325 Brinell. Connecting rods running directly on a hardened crankshaft have shown very favorably as regards bearing wear, and have operated engines as high as 15,000 miles under severe operating conditions without any detrimental effects."

It would look as though bearings directly in the aluminum rod would outwear the ordinary babbitt bearings running directly on the crankshaft. This is likely due to the reduction of the centrifugal and inertia forces due to reduction of weight, and it may also be due to the better condition of the bearing itself and better lubrication, which is possible because of this. Forged aluminum rods, as a rule, have a tensile strength around 55,000 lb. per sq. in. Engineers who have studied the subject state that it would be impracticable to use them with iron pistons, but that in connection with aluminum pistons they should be a success. In other words, some engineers doubt that, strength for strength, the aluminum rod would be any better or lighter than a steel rod of the best possible material, machined all-over to a scientific section.

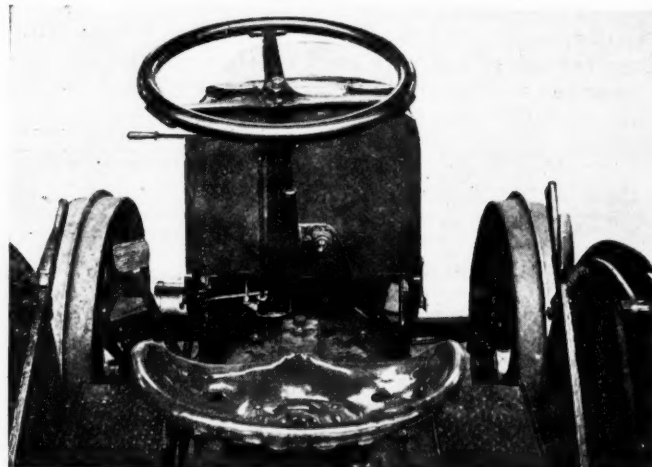
All of the engineers who have gone into this matter are of the opinion that there are many years of experimental and development work ahead of us before we are going to find the aluminum forging a production proposition. There are, however, possibilities, particularly in connection with small bore engines and with very light pistons.

A very interesting feature in regard to the use of aluminum for forgings, etc., is the fact that some development work will have to be done with the material in order to make it better adapted for thread cutting. Most parts, such as clevises, etc., have to be threaded, and threads in aluminum are generally poor, unless the other part is screwed in and remains stationary. It must be also admitted that in many parts the saving in weight is so slight that it does not pay to take a chance with material until further development work is done.

An interesting situation was run into not long ago by an Indianapolis manufacturer on aluminum transmission cases. This concern states that aluminum has always been satisfactory whenever they have used it, but that they have found that the cast iron transmission case transmits considerably less vibration and noise. This concern ran into a peculiar matter with the Underwriters' Laboratories in regard to a transmission lock which is fitted on this gear-set. The Underwriters objected to passing it, as long as it was embedded in aluminum on account of the fact that aluminum can so easily be chipped away with a cold chisel.

Several concerns have tried aluminum housings for axles, and while, in general, it has been highly successful, they have been afraid to use it as a commercial proposition. The matter of the aluminum front axle is in about the same condition. That is, while it has been tried by a number of concerns and no marked objections have been found, still it has been regarded as dangerous to put out as a commercial proposition.

Altogether, a survey of the situation leads us to believe that we have made very favorable progress in the use of aluminum castings and are on the eve of important developments in the use of aluminum forgings. The material is still too new, however, and has been out too short a time in the experimental laboratories for any quantity production. There is the fear that the material may prove treacherous and variable, and also that it may not stand the test of time and road vibrations. It is quite certain that another year of development will accomplish much, and if we are to have smaller, lighter, and more economical cars, as a result of the fuel situation, it is very probable that the use of aluminum, both as a casting and as a forging, will be considerably accelerated.



Austin tractor control. The gear lever in the center moves transversely

Bad Roads and Hard Usage Feature Truck Use in Petroleum Industry

Stories of deep mud and bad roads are not a myth, according to a report prepared by the *National Petroleum News*, but motor trucks and tractors are overcoming difficulties and becoming more popular each year. The industry is growing, the truck market is large and should be developed

THE petroleum industry offers one of the largest and at the same time one of the most difficult fields for exploitation by the truck salesman that is to be found in the United States. This industry is a large potential buyer of motor trucks because transportation difficulties have to be met in practically all of their ramifications and neither the horse nor the railroad is capable of meeting the varying demands in most cases. Recently the industry has been buying tracklaying tractors to overcome the worst ground conditions.

The demands upon a truck in the petroleum industry, on the other hand, are such as to call for the highest qualities of durability and "toughness" that can be obtained.

The oil business falls naturally into three divisions:

- (1) Production—that division producing the crude petroleum from the ground.
- (2) Refining—that division which receives the crude petroleum from the producer and refines it into various products.
- (3) Marketing—that division which takes the refined products of the petroleum from the refiner and distributes, through various channels, to the ultimate consumer.

The distinct market for motor trucks and trailers lies among the producers and marketers, although the refiners buy as many trucks as do manufacturers in any other line of business.

There are seven so-called oil fields in the United States, the largest of which are the Oklahoma and the California fields. There is at present large boom in Northern Texas but competent authorities estimate that this field has about reached its peak. The possibilities and probable developments of the various fields can be obtained from *The National Petroleum News*, which has furnished the material for the digest presented in this article.

Difficult Truck Conditions

The conditions which a motor truck must meet in the petroleum industry are unfavorably distinctive. Briefly, the difficulty may be summed up in the following sentence: "The topography of the oil fields of this country, in almost every region, is unfavorable for traffic." Even in the older and more developed fields, much of the country is rocky and mountainous. The terrific mud and almost impassable bad roads of oil country are proverbial. Practical experience shows that the stories of almost unbelievable quantities of mud are not a myth; the truth is, indeed, stranger than the fiction.

Another difficulty is the extremely heavy loads the trucks are called upon to carry practically all the time. To accomplish these tasks, trailers are almost univer-

sally used. In the oil fields, a truck without a trailer is as uncommon as a locomotive without a train. The two-wheeler type of trailer is used most extensively, although some companies operate extra heavy four-wheel trailers in hauling boilers and other heavy items.

The material which must be transported for the drilling of a single well is so great as to surprise the average man unfamiliar with the details of drilling. The pipe and casting alone necessary to drill one well weighs about 117 tons, while the boiler and engine will weigh at least 15 tons more. This weight represents only the absolutely necessary material and is loaded on trucks and trailers in as large quantities per load as is possible. Work in the oil industry is usually in a particular hurry, so that the chief concern of the truck driver is to get the material to its destination regardless of the wear and tear on his vehicle.

The Necessity for Speed

There is one peculiar feature of the business with the drilling branch of the industry. It is likely that the master driller will receive unexpected orders to begin operations in a new part of the field, perhaps ten and perhaps fifty miles from where he has been working. Haste is impressed upon him. He thinks only that he must get in operation in this field before any of the rival drillers, for the first well to strike in a field gets the best of it in many ways. Consequently, he disregards the expense and if he needs trucks, he goes out to buy them. He buys them where he can get deliveries and there are many stories from the Texas fields of dealers who have reaped a harvest by having the trucks at hand.

The man who actually does the buying of trucks is usually the production superintendent, the person in charge of all motor transportation, or a high executive.

Because of the bad road conditions, tractors of every kind are finding a ready market in many parts of the petroleum industry; especially is this true of the Texas field. These are used with trailers, as are the trucks, and are found to save the operators much money in practically every case.

The salesman should bear in mind that the market for trucks in the petroleum industry is a comparatively fixed one; the great influx of population into such towns as Ranger, Cisco, Drumright, etc., does not mean that every man who has migrated to that country is a prospective purchaser of motor trucks. The motor truck buyers are the big producing companies; the men who have been in the oil business for years and the men who control, not one lease, but thousands of acres. There are probably fifty thousand men engaged in the oil industry to-day but the purchasing power lies among two or three thousand individuals and companies.

Training 300 Apprentice Die-Makers with One Instructor

The systematic utilization of agencies already at work in connection with regular factory work has enabled a large automobile manufacturer to give specialized individual training to 300 apprentices with only one full-time instructor. The methods described are worth special attention.

By Norman G. Shidle

THE distinctive feature of the training course for die-makers and tool-makers described here is that special equipment has been unnecessary for operating it, while a small force of full-time instructors are carrying on the work successfully. This is made possible simply by the systematic utilization of the agencies already at work in connection with other phases of factory production activity. There are, in addition, a number of novel minor features embodied in the method of training die-makers and tool-makers at the Ford Motor Co. that make it of peculiar interest.

There are some 3500 tool- and die-makers in the Ford plant, and the ratio of apprentices to mechanics is kept at about 1 to 5. To be admitted to the apprentice course, a man must be between the ages of 18 and 25 years, and must have been at work in the factory for at least six months. The latter rule is invariable, but the age limit of 25 is not strictly enforced in all cases.

There is an educational, as well as an age requirement for admittance to the apprentice course. A man must have completed the 8th grade in school or its equivalent. For those prospective apprentices who look promising, but who have not had the requisite education, classes are provided in another division of the Ford educational department. The work of all the Ford schools is in charge of F. E. Searle.

The apprentice course lasts from three to three-and-one-half years, the exact time depending upon the student's ability. About 311 men are now in training as diemakers and about 400 as tool-makers.

The apprentices work in two shifts of eight hours each. The classroom work is done outside of this time. Two-thirds work on the day shift, and one-third on the afternoon shift. Every apprentice starts at the \$6 a day minimum wage, regard-

less of how high his rate may have been before entering the training course. At the end of the first year, his rate becomes \$6.40; at the end of two years, \$6.80; at the end of two years and six months, \$7.20 and at the end of three years, \$7.60 or more. When a man has completed the course, he is in line for a better job in the shop. Then if a foreman job becomes vacant later, he is given favorable consideration because of previously having been graduated from the apprentice course.

Since the training for both die-makers and tool-makers is identical up to the point at which bench work is begun, a description of the course for die-makers will illustrate fully all the details of methods and practice.

Training is given the men in both classroom and shop, but the latter type of training predominates in the Ford system. The hours spent in a classroom total three a

week, the rest of the time given over to actual work in the shop.

No special equipment is set aside for the apprentices and no "hand picked" work is given them. They get their training in routine shop work, doing whatever job comes to them in the normal course of the day's work. Each apprentice is, of course, shifted from one machine to another from one department to another as he attains proficiency on a particular job. But in all cases, he is gaining his experience under practical conditions and is performing productive work. He gets his share of the difficult, as well as the simpler jobs, and when his training course has been completed is capable of handling work of any kind with equal facility.

To carry out this plan, effective individual instruction is obviously necessary. Such instruction is achieved with a force of only one full-time instructor for the 300 apprentices.

The plan is worked out in this way:—

TOOL APPRENTICE DEPT.
PYTHAGOREAN THEOREM

LESSON #22

1

The area of a rectangle is equal to the product of the two sides.
Example: The area of a rectangle 4" long and 3" wide is 3 x 4 or 12 square inches.
The sides squared equals the area of a square.
Example: The area of a square whose sides are 6" equals 6² or 36 square inches.
If the area and one side of a rectangle are given, the other side can be found by dividing the area by the given side.
Example: The area of a rectangle equals 12 sq. inches, and one side is 3, then the other side equals 12 or 4".
If the area of a square is given the sides can be found by extracting the square root of the area.
Example: The area of a square is 16 sq. inches, then the sides equals $\sqrt{16}$ or 4 inches.

The proof that the square of the two sides of a right angle triangle are equal to the square of the hypotenuse.

The total area of FIG. 1 is equal to the total area of FIG. 2.
In FIG. 1, if the area of the pieces 1, 2, 3 and 4 be subtracted from the total area then the parts that remain will be A² + B².
In FIG. 2, if the area of the pieces 1, 2, 3 and 4 be subtracted from the total area then the part that remains will be C².
In both figures 1, 2, 3 and 4 all have the same area.
If the total area in FIG. 1 and FIG. 2 are equal, and the same amount be subtracted from both figures, then the parts that remain must be equal.
With a little logical thinking it becomes evident that A² + B² = C².

(5) (6) (7) (8)

Equilateral Triangle

No.	A	B	C
1	11.25	6.54	?
2	12	17	?
3	?	6.434	7.450
4	.248	?	6.323

1—A sample lesson in mathematics

5—Apprentice transfer card, used when apprentice is transferred from one machine to another

6—Certificate of graduation issued to each apprentice upon the completion of his course

1. There is one foreman for every twenty men in the factory. The foreman is utilized as an instructor for the apprentices in his department.
2. Small groups of two or three apprentices are starting and graduating all the time. Thus there is never a large group of absolutely green men to be taken care of at the same time.
3. The apprentices are so distributed and placed by the supervisor that only a limited number are in any one department at any one time. Thus the instructing possibilities of the foreman are not over-taxed.

To one familiar with industrial training theory and practice, numerous objections to the practical success of this plan arise at once. It will be objected that the foreman is not inclined to take an interest in instructing green men and that, consequently, his assistance will be only superficial; and that the foreman does not have the time to give instruction if he is to accomplish his real job in a competent manner.

Getting Foreman Co-operation

It is true that foreman co-operation in the fullest sense of the word is essential to the success of this system. It is true, too, that such co-operation was not obtained the first day the system went into effect. Gradually, however, the advantages of the system have become apparent to the foremen. In the beginning some of them opposed having apprentices placed in their departments at all; now those same foremen are asking for more apprentices. This change of heart is due to two factors. The first graduates of the apprentice course have recently come out, and the excellence of the workmen produced has impressed the foremen favorably, as compared with the workmen obtained by hiring from outside. Then, too, the foreman is given to understand by his superiors, that this task of training apprentices is definitely a part of his job, that it is not to be considered a side issue, but as an integral part of his regular duties. To be a successful foreman, he must accomplish his task of instruction in an effective manner. Moreover, the fact that there are more foremen than usual in proportion to the number of workmen facilitates the working out of this plan.

Foreman co-operation, however, has been attained chiefly through a long period of effort and education on the part of those in charge of the training work. That effort has been successful and the system is now running smoothly.

Careful planning is, of course, necessary in the distribution of apprentices, but some of the departments in which the operations are more simple than in others can carry a greater share of green men at one time, since the burden of instruction is correspondingly light.

The full-time instructor uses his efforts to instruct the green men in the beginning and to help out with individual instruction and attention in any department where his services may be especially necessary. He supplements the instruction given by the foreman and helps the man to correlate the experience gained on one machine with that gained in later work. The instructor, in brief, combines the work of general supervision with that of individual instruction in the places most needed.

The task of properly placing and moving the apprentices is important to the success of the system. This work involves ascertaining when a man has become proficient enough on one machine to be moved to another, seeing to it that no one foreman is overloaded with apprentices, and that the men are so placed as to receive the best attention and instruction possible. The apprentice die-makers are under the supervision of John E. Wills, who keeps track of each man's progress and proficiency, and directs his advancement from the beginning to the end of the course.

Practical Training Outlined

The actual training of an apprentice die-maker begins with instruction in reading micrometers and blue prints. The beginners are first taught the use of the vernier, micrometer, bevel protractor, height gage, gear tooth vernier, etc. Before they start on any machine work, they must be able to read a blue-print; most of the apprentices have this ability before they start the training course. From then on, the two periods a week spent in the class room, amounting to three hours in all, are devoted to mathematics and mechanical drawing. Lessons to fit in with the course have been specially prepared, and the apprentices are required to do some home work in this connection. Fig. 1 shows a sample arithmetic lesson.

The first three months of the apprentice's work in the shop are spent in chasing tools, running errands, and doing whatever odd jobs turn up. In this way he is enabled to learn the names of the various tools, the layout of the different departments, and, in a general way, the conditions under which he is to work. Having thus become familiar with the general atmosphere of the shop, he is ready to begin work on his first machine, the shaper. From this point the apprentice is moved from place to place as he gains sufficient proficiency on each machine. The approximate lengths of time spent on each machine are as follows:

Shaper	6 months
Lathe	7-9 months
Milling machine.....	7-9 months
Grinder	6 months
Bench work.....	9-12 months
Hardening	1-3 months

On each machine he is given thorough instruction. He is taught how to get the best work from the machine, and how to operate it with a minimum of wear and tear. On the shaper, for instance, the following points are covered by the instructor when the man first begins work on that machine:—

1. How to grind tools,
2. How to operate the shaper,
3. How to plan work,
4. How to use the feed and speed,
5. How to "square up" the work.

Fifteen departments are used to train apprentice die-makers including the following: hot header die, die sinking, small die repair, small die construction, special tool, machine repair, large machine, crankcase die, grinding room, stripper die, body die, elimination die, bow-socket die, and fender die.

Progress Records

A careful record of the student's progress is kept during the entire course. Fig. 2 shows the report card which is filled out each month by the foreman for each apprentice in his department. This card is turned over to the supervisor, Mr. Wills, who files it for future reference. Fig. 3 is the form kept in the supervisor's file to record the work done by the apprentice. On the right is the front side of the card, while on the left appears the reverse side. The reverse side is the most important as a record. It refers only to the shop work of the apprentice, and shows the length of time spent on each machine together with the degree of proficiency attained.

Fig. 4 is the record kept in the office of the superintendent of schools. It is a complete record of the student's activities, especially as related to his classroom work. As in the previous figure, the front of the card is shown on the right and the reverse side on the left. This record is to a large extent self-explanatory. Fig. 5 is the card used

when transferring an apprentice to another department.

When the apprentice has finished his entire course, he is given a certificate of graduation, similar to the one shown in Fig. 6. This certificate shows the work which he has completed, the grades he has attained, and the type of work in which he has displayed most marked proficiency.

Up to the present time, 83 apprentices have been graduated from this course, and additional men are being turned out every week. The waiting list for the course is always a long one, so that discrimination can be exercised in choosing the men likely to be best adapted to the work.

The graduate apprentice is fully capable of assuming his place as a skilled die-maker. During the training course, no attempt is made to pick out the work for the apprentices, as noted before. Thus a common fault of training school graduates is eliminated. That is, most training school students can do regular lines of work, but are unable to cope with unusual work of any kind. This, at least, was one of the faults found with the men turned out from a segregated training school which preceded the present method of training at the Ford plant.

A separate gallery was set off for the training school, special equipment installed, and instructors provided for the apprentices. This plan did not work out very successfully and the present plan was substituted for it. Though

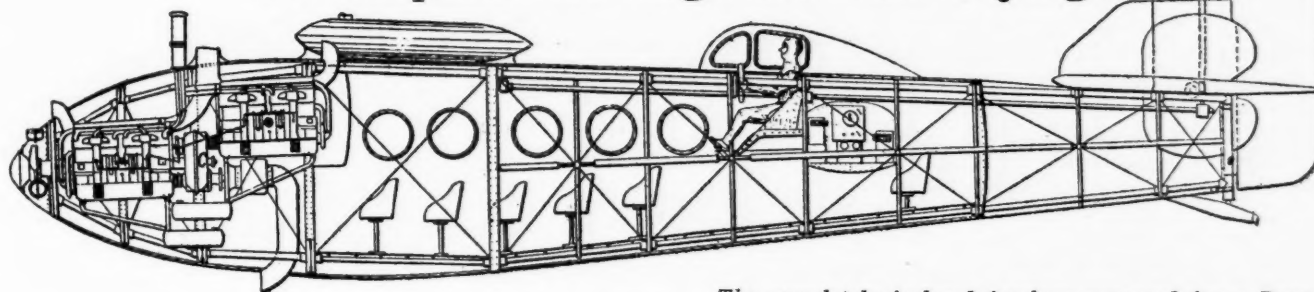
some difficulty was experienced in the beginning in building up this system, its success has more than paid for that trouble. Under it the apprentice is taught to rely on himself; he does not depend so largely upon his instructor as in the segregated training school.

Records show that throughout the course the amount of work spoiled by apprentices is no larger than that spoiled by the older and more skilled workers. This constitutes an excellent indorsement of the methods of instruction used.

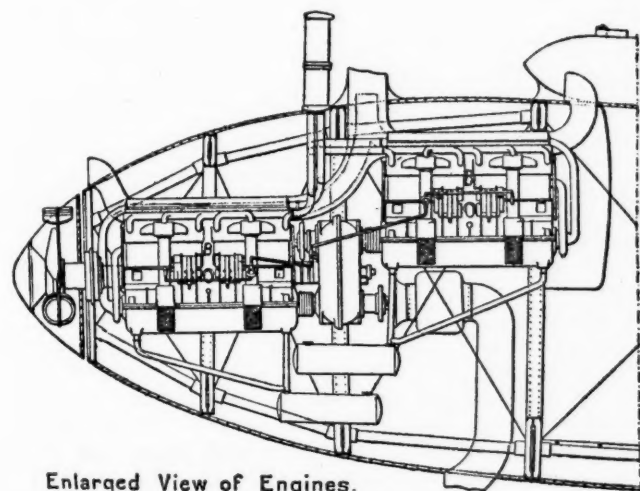
The course has now been in operation long enough to justify the statement that it is a success; a fact due largely to the careful and vigorous efforts that have been made in building it up.

Mr. Nicolai, in charge of the tool machine shop, who is intimately associated with the work of training the tool-makers, said recently: "Now that the first graduates of this course are being turned out, the foremen are beginning to get really enthusiastic about it; they can see the results which it is accomplishing. They used to 'kick' a little about the trouble of breaking in these new men. Now they see the difference; they are getting good men in the end—something we can't hire ready made. Before, the foremen got 'dubs' and more 'dubs'; now they get 'dubs' and later they get good men."

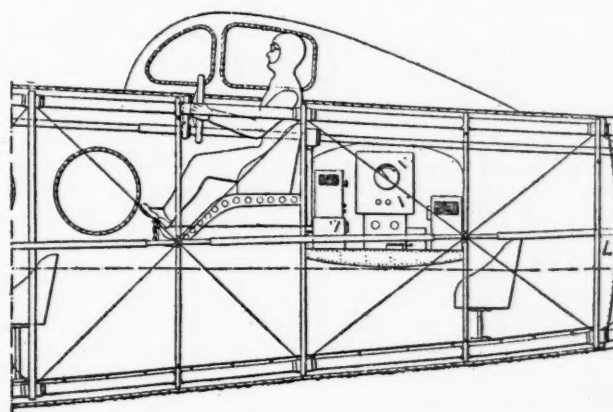
An Airplane for High Altitude Flying



The completely inclosed fuselage proposed for a Breguet commercial plane



Enlarged View of Engines.



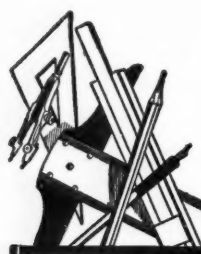
Enlarged View of Pilot's Accommodation.

THE design of a proposed Breguet commercial airplane for altitude flight is illustrated here which contains many of the latest ideas in construction. The power plant is the 32-cylinder Breguet-Bugatti engine group exhibited at the Paris exhibition and supplied with a mechanically driven supercharger. The engines, passengers and crew are inclosed in a sealed cabin which is kept at sea level pressure by a supercharger.

As far as can be ascertained from the drawings, there are accommodations for ten passengers. The crew consists of the pilot, who sits in a raised conning tower and

a radio operator who is down on a level with the passengers. The structure is of metal, the sealed portion extending to behind the radio operator's position.

The fuel tank is outside on the top of the fuselage and is of streamline form, this being in accord with the usual Breguet practice. The cooling of the exhaust gases should be noted. Separate oil tanks are provided below the engines but there is no sign of an oil radiator. The cooling radiator is outside and above the engines. This position is very advantageous due to the thermo-siphon action being assisted in this way.



The FORUM



Most Advantageous Connecting Rod Section

Editor AUTOMOTIVE INDUSTRIES:

I HAVE read with interest the article by Mr. Wiedeman on "Failure of Connecting Rods at High Speeds," in the June 3 issue of AUTOMOTIVE INDUSTRIES. There are, however, some errors in the formulæ given, which I would like to point out.

In the third paragraph w is stated to be weight per unit length, whereas it obviously should be weight per unit volume, since the cross-sectional area of the rod is involved in the formulæ. Further, to obtain the centrifugal force on any section of the rod w should be divided by g to bring it to mass.

The expression for the distance k of the resultant of the centrifugal forces from the piston pin is only exact for a straight rod, and it is not correct to call this a general expression. I enclose a sheet on which I have figured the distance k , and also the B. M. on the rod. You will see that there are some differences between Mr. Wiedeman's formula and mine besides the omission of g .

Mr. Wiedeman has evidently taken the piston pin reaction to be exactly one-third of the resultant inertia force, but it will be seen that the true value of the reaction as obtained in my equation (4) is in no way more complicated. We also differ in the constant of the last term of the B. M. equation, which I cannot explain.

I cannot agree that a minimum stress results when a uniform rod is used. Assuming the usual I section, the cross-sectional area is roughly proportional to the depth of the section. Also, the section modulus varies approximately as the square of the depth, hence also as the square of the area. Neglecting the effect of the second term of the B. M. equation in square brackets, which actually reduces the B. M. when B is greater than A , the B. M. is roughly proportional to the value of B , A being kept constant. The stress produced being equal to the B. M. divided by the section modulus, it is seen that for B greater than A , the inertia stress will be smaller than for B equal to A . I have taken as an actual case the tapering connecting rod of a 5-ton Pierce-Arrow truck engine, and compared the stress with that of an assumed straight rod whose depth of section is equal to the mean of those of the large and small ends and which, therefore, is of the same weight. The stress in the straight rod figures out about 6 per cent greater than that in the tapering rod.

The case of a tapering tubular rod is still more favorable. For a hollow rod whose thickness is small compared with its diameter, the section modulus varies approximately as the cube of the diameter. The area varies as the first power of the diameter for constant-thickness of wall. Hence, if the inertia B. M. is increased by making B larger, the stress becomes actually smaller.

There are obviously other reasons for tapering connecting rods, principally the consideration of strength where the bolt bosses join the shank of the rod.

Passing on to the formula for the time of vibration of a rod on page 1254, I should like to know how this is ar-

rived at. I have found in a German text book on mechanics by Föppl, the derivation by calculus of a formula which reads as follows:

$$T = \frac{2l^2}{\pi} \sqrt{\frac{\mu}{E. I.}}$$

where μ is the mass per unit length.

This formula has the same physical dimensions as yours if M is taken as the mass of the whole rod. The constants in the two formulæ only differ numerically by 6 per cent.

In the formula on page 1255 for the inertia tension on a connecting rod, the reciprocating weight per sq. in. of piston rod w has been misplaced. The formula should read

$$T = A [0.00017 r N^2 w (1 + n) + p]$$

Furthermore, the dimensions of the different items are not given. If r is in inches it must be divided by 12 because acceleration is in ft. per sec.² w being in pounds, it must be divided by g to get mass, since the force required is mass multiplied by acceleration. With this correction the constant should be

$$\left(\frac{2\pi}{60}\right)^2 \times \frac{1}{32.2 \times 12} = 0.000028$$

F. FRIEDRICHS.

Referring to the comments of F. Friedrichs, in the notation of the third paragraph of my article in the June 3 issue, w is stated to be weight per unit length. This should be weight per unit volume. The formula which follows should contain g in the denominator and should read

Max. centrifugal force at any section for unit length =

$$\left(A + \frac{x}{l}[B-A]\right) \frac{wx\omega^2 r}{g \times l} \text{ lb.}$$

g should also appear in the denominator of the B. M. expression of the fourth paragraph.

I am aware of the fact that the location of the center of percussion is not exactly two-thirds the distance from the piston pin in all cases. Graphical methods of determining this point for straight, uniformly tapering and non-uniformly tapering rods seems to justify its location two-thirds of the distance from the piston-pin. In the case of a uniformly tapering rod in which the cross sectional area at the crank end is 1.5 times that at the smaller end. (which according to the data at hand is much greater than the usual ratio), the error in the location of the center of percussion is only 3 per cent when assuming that it is two-thirds the distance from the piston-pin. An error of this order is permissible when considering forgings which are not machined. The expression which Mr. Friedrichs has developed (equation 3) appears to me to be a correct formula for determining the location of the center of percussion.

I cannot agree with the reasoning advanced to disprove my conclusion that the stress induced in a straight rod, due to inertia, is less than that in a tapered rod. In the first place, Mr. Friedrichs assumes that the cross-sectional

area of the conventional I-section rod varies as the depth. Referring to Heldt, "The Gasoline Automobile," 1919, it is seen from the analysis on page 219 that the area of the section varies as the square of any linear dimension. Mr. Friedrichs' deductions, based on this evidence, are therefore in error.

Furthermore, I do not consider the basis on which the comparison between straight and tapering rods have been made to be correct. This comparison has been based on rods having equal weight. In my opinion, the better method of comparison would be on the basis of equal least radii of gyration, because we would then be analyzing the columnar rigidity of the rods, and in almost all cases this phase of connecting rod design is of the most importance.

To show the relation of straight and tapering rods, based on equal radii of gyration, we will use the data and deductions on pages 219 and 221 of "The Gasoline Automobile," already mentioned. For I-section rods, the area of cross-section is given as $11.3 t^2$, in which t is the web thickness. The square of the least radius of gyration is given as $.84 t^2$. For the hollow tubular rod, whose internal diameter is three-fourths of the external, the cross-sectional area is stated to be $.344 D^2$ and the square of the radius of gyration as $.0974 D^2$. In the case of a comparison of rods of equal weights, we would equate the area of the I-section rod to that of the round, giving

$$11.3 t^2 = .344 D^2 \text{ or } D^2 = 32.8 t^2.$$

Substituting this relation in the expression for the radius of gyration for tubular rods, we obtain,

$$(\text{Radius of Gyration})^2 = .0974 D^2 = 3.19 t^2.$$

Since the square of the radius of gyration for the I-section rod is given as $.84 t^2$, the ratio of the radii of gyration is

$$\sqrt{\frac{3.19}{.84}} = 1.95. \text{ This means that for equal weights, the hollow tubular rod has 1.95 the columnar rigidity of the corresponding I-section.}$$

We will now illustrate that on a basis of equal radii of gyration, the hollow tubular connecting rod will set up 33 per cent less unit stress from inertia force than the conventional I-section rod. The hollow tubular rod will be considered the basis, in which the length, cross-sectional area, weight and least radius of gyration are all taken as unity. Still using the data on pages 219 and 221, we calculate the section modulus for the hollow rod as $.067 D^3$. The unit stress in the rod due to inertia forces will be the bending moment divided by the section modulus. The bending moment can be determined by the formula derived in my original article and the unit stress will therefore be

$$\begin{aligned} \text{Unit Stress} &= \frac{\text{B. M.}}{\text{Sect. Modulus.}} = \frac{W \omega^2 r \left(l x - \frac{x^3}{l} \right)}{g \times 6 \times .067 D^3} \\ &= 14.9 \frac{W \omega^2 r \left(l x - \frac{x^3}{l} \right)}{6g D^3} \end{aligned}$$

In the same way, the corresponding expression for the I-section rod is developed. Since the cross-sectional area varies as the square of the web thickness and the radius of gyration as the web thickness, the cross-sectional area varies as the square of the radius of gyration. Using the relation that the I-section rod has 1.95 the radius of gyration of the round section rod for the same cross-sectional area, we may write the relation

$$1 : 1.95 = \sqrt{1} : \sqrt{\text{Area of I-section}}$$

or area = 3.82 that of the round section rod.

With this information, we are able to write the corresponding section modulus for the I-section rod whose

radius of gyration is the same as that of the hollow round section and whose area (and hence its weight) is 3.82 that of the round rod. First, we equate the expressions for the squares of the radii of gyration,

$$\sqrt{.0974 D^2} = \sqrt{.84 t^2} \text{ or } D^2 = 8.62 t^2.$$

From data on page 219, the section modulus of the I-section is found to be

$$\frac{9.45 t^4}{1.95 t} = 4.85 t^3$$

Substituting the value of

$$D = 8.62 t^2$$

(for equal radii of gyration) we obtain for the section modulus for the I-section

$$4.85 t^3 - 4.85 \left(\frac{1}{8.62} \right)^3 D^3 = .192 D^3$$

and the unit stress induced in the rod by the inertia forces will be approximately,

$$\begin{aligned} \text{Unit Stress} &= \frac{\text{B. M.}}{\text{Sect. Mod.}} \\ &= \frac{3.8 W \omega^2 r \left(l x - \frac{x^3}{l} \right)}{g \cdot .191 D^3} \\ &= 19.8 \frac{W \omega^2 r \left(l x - \frac{x^3}{l} \right)}{6g D^3} \end{aligned}$$

(based on average section).

The ratio of constants in the unit stress expressions for O and I section rods is found to be $\frac{14.9}{19.8}$. In other

words the O hollow section rod produces a unit stress of 33 per cent less intensity than the I section rod whose columnar rigidity is the same. It is apparent, therefore, that the straight rod has a decided advantage over any tapered design in so far as transverse inertia bending alone is concerned. The additional advantages of close machining, higher permissible unit stress and the consequent fine balancing for high speed work should recommend the straight hollow rod for all exacting service over the cheaper but less closely dimensioned I-section connecting rod.

Concerning the comment of Mr. Friedrichs relating to the vibration formula on page 1254, I would first correct a typographical error. The formula was meant to read

$$T = \frac{2}{\pi} \sqrt{\frac{M}{K}}$$

where M is the mass of the inertia element.

K = the force which produces unit transverse deflection.

In the same way, the following formula should have the π in the denominator to read

$$T = \frac{2}{\pi} \sqrt{\frac{M \rho}{85 E I}}$$

where l = effective length of rod.

E = modulus of elasticity.

I = section modulus.

The first of these two vibration formulæ will then be the same as that quoted by Mr. Friedrichs from Foppl, "Vorlesungen über Technische Mechanik," Vol. IV, page 266, formula 176. The second is one derived by myself, based on the theory of beam elasticity, which I have carefully checked, and seems to give excellent results in practice.

(Continued on page 483)

A Training School for Foreign Representatives

One large organization believes that only thoroughly trained and competent men are equipped to handle automotive business in foreign countries. As a result, a twelve months training course has been established and is now in full operation. This article describes its methods interestingly.

By George E. Quisenberry

FOREIGN trade, it frequently has been said, must be built upon knowledge and ability; and those who participate in it, if the business is to be lasting, must possess a broad understanding and an intelligent appreciation of the difficulties and problems involved. It is something that cannot be engaged in without preparation; to do so haphazardly is to jeopardize both present business and future profits.

Year by year, the export business of the automotive industries has been gaining in volume and value. Firm after firm, realizing the potentialities of the overseas markets, has gotten into it. Some have done so hastily and ill-advisedly and the results have been unfortunate. But others, with foresight and ability, have built up the firm foundation of a successful business structure. Such firms as the latter are the ones that will keep the American-made automobile in the foreign districts of the world in competition with the makers of any and every country.

Consequently, it is of interest at this time, when many companies are finding pitfalls in their export trading, to review the principles and guiding factors in the Training School of the General Motors Export Company, which, of course, handles the foreign business of the allied lines of the General Motors Corporation. Its underlying theme is that only the trained and competent are equipped to handle such business and, if this business is to take the course its production and manufacturing skill justifies, a ready personnel must be at hand to go into the overseas centers to work out and uphold the merchandising, financial, and service policies of the General Motors Export Company.

The school probably presents the longest and most intensive course of any of the training schools maintained, either for foreign or domestic workers, by any of the automotive companies. The course continues for twelve months, in all of which the attendants are classed as students, with the standing, emoluments, and work that accrue to such a man. Other schools in the automotive field—devoted primarily to the training of men for the home trade—run from two weeks to a maximum of four months, and in some of them the students devote only a part of their time to their study courses. But the General Motors Export Company believes that a year is not too much to devote to the making of its future foreign representatives and considers that the necessary training is only well begun after the twelve months have passed. The Company feels that the education of its overseas workers cannot be completed within a few days or a few months or, in other words, that it cannot entrust its foreign business to men haphazardly and indifferently trained.

The school was established in April of this year, the first classes being held at that time. Several months be-

fore had been spent in making up the plan and preparing the courses, an undertaking that confessedly requires much thought and attention. The students are limited to fifty carefully picked men, ranging in age from 22 to 39 years. An attempt is made to obtain students who have had a college education or its equivalent. The Admissions Committee, composed of personnel and department heads, chooses the man on his personality and promise as well as upon his academic record.

The first class included men from the export organization already built up, and many from outside. But of these, carefully picked as they were, some already have been weeded out, a process that will continue throughout the course and which should insure a high average in the graduating classes. New men have been brought in to fill the vacancies, the aim being to keep up a steady flow of students into the classes, and from there into the business organization and the foreign divisions, which are being established throughout the world.

The students are trained in three branches: as Salesmen, Accountants, and as Technical Men. The classes are made up of 26 of the first and 12 each of the other two, since that represents about the ratio in which they will be needed. They devote two hours each day—from 3:30 until 5:30 o'clock in the afternoon—to class work consisting both of lectures and of practical demonstrations. The other part of the business day is given over to work in the various departments of the company. The men are taken into these company departments as students, performing whatever work is available for them, but with the first thought in mind of getting them acquainted with the department activities, its methods, etc. This attempts to give the men a practical training in actual business conditions and acquaints them perhaps more than anything else with the policies of the company.

The instruction covers six subjects: Foreign Trade, Commercial English and Cables, Accounting, Gas Engines and Automobile Construction, Salesmanship, and Foreign Languages. For the first seven months, the course is identical in that each student, regardless of the duties for which he is being trained, takes all of the subjects and works in each of the departments. This is based upon the belief that a salesman must have technical knowledge of the equipment he is to sell, the service and technical man must be in part a salesman, and the accountant must be educated along all these lines.

The other courses are what their names stand for. The foreign language work embraces French, Spanish, and German; but each student takes only one language, specializing in that one rather than attempting to get a smattering of all.

Instructors for the classes are obtained both inside and outside of the organization of the company itself. Many of them are experts from other industries or from the colleges and universities in the city of New York where the school is held. The school is under the direction of the personnel department of the Export Company, as a distinct division of that department, having its own head and its own directing organization. It works in close conjunction with the other departments of the company and its lectures are often attended by department heads and other workers. It announces its classes and lectures which are held daily, and invites attendance, from outside the school itself, of those who might gain from the instruction.

This course of study continues for about seven months, after which the students are sent to visit the various manufacturing plants of the corporation so that they may have an idea of the methods used. This inspection then will be followed by five months of specialized work, each student working along his particular line. The service and technical men will be sent into the training shop and garage that is located in New York, and their previous instructional work in assembling, tearing down and repairing cars, trucks, and tractors will be enhanced by intensive practical work in the shop itself. The salesmen will go into the New York branch of the company and work there during the remainder of their term. The accountants and financial men will work in the Treasurer's department.

Upon completion of their courses, the graduates will take positions as regular employees in the organization until vacancies develop in the foreign fields. Upon entering the school, each man is given a salary of \$100 a month

as a student, which is increased after his graduation when he takes a place in the company. They become then, of course, regular employees.

Throughout the course, the student is under continual observation, not only as to his business ability but as to his moral character as well. It is the belief of the General Motors Export Company that it cannot be too careful in the choice of its men for the overseas positions. As potential executives and assistants, they must be men who will maintain high standards. In the foreign field, a representative is so much further away from the home offices that unusual responsibility devolves upon him. He cannot be recalled, for instance, over night or brought back for frequent conferences. He is distant from home by many weeks and many thousands of miles; letters and communications to him may require as long as a month or even three. Consequently, it is recognized that he must be "fit" for his job before he goes into it.

The training course, as now planned, suggests that the training for many men cannot be completed within the year but must, in effect, be continued even after graduation. This will be done through the departments in which the students will be placed pending their departure to the sales fields. The course itself is a strenuous one and requires much "burning of the midnight oil." Already it is apparent that the turn-over among the students will be high. Admittedly the expense is high, but the need for the trained men is apparent.

The Company is opening its branches throughout the world and needs the personnel to man them. It has not been able to find these workers, specialized in both automotive and foreign selling; therefore, it has gone about their training within the organization itself.

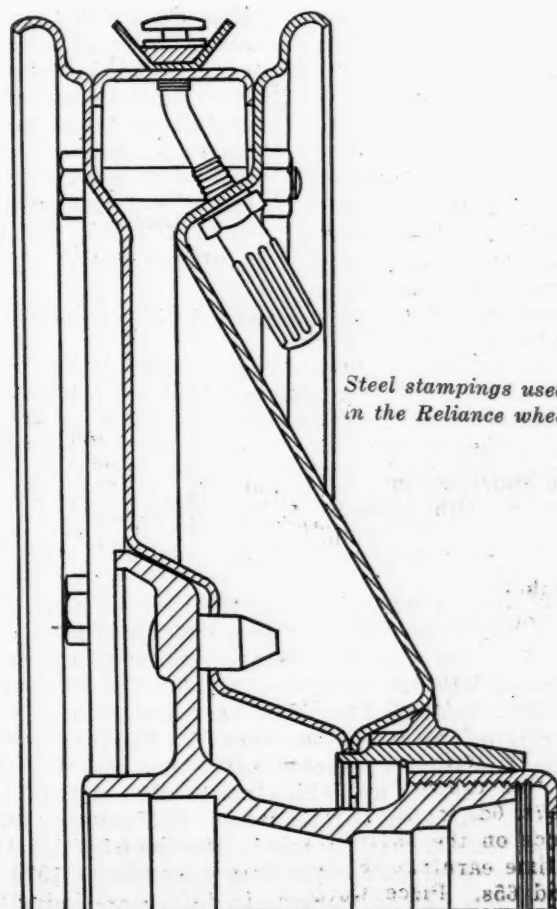
Double Disk Wheel

THERE are many designs of disk wheels on the market at the present time. The two-disk type has not received as much attention as the single wheel. The illustration shows a wheel of this design as constructed by the Reliance Wheel Co. The outer disk is a one-piece steel stamping, including the rim. The inner disk is of similar construction, and the two are bolted to a felloe band, which is a one-piece steel channel made to rim size.

A malleable iron hub with steel driving lugs is fitted to the disks and has a hub cap with an automatic locking device. Protected in an offset in the disk is a Schrader standard valve stem. Lightness combined with strength are among the claims made for this wheel, as well as accessibility for cleaning, there being no recesses where dirt can collect and defy removal. The wheel proper has only three parts, the felloe band and the inner and outer disks, which latter are securely attached to a malleable iron hub.

We understand that these wheels are now being produced in large numbers.

COMMENTING on British and American trade with Canada, it is stated in the June *Bulletin* of the Federation of British Industries that in 1915 the machinery imported into Canada from the United Kingdom was of a value of \$1,316,000, and that from the United States of \$14,865,000. In 1919, while the American figure was over \$45,000,000, the United Kingdom imports had dwindled to \$635,000. Again, taking glass and glassware, between 1915 and 1919 the British imports into Canada diminished in value from \$775,000 in 1915 to \$188,000 in 1919, while the value of the American imports more than doubled within the same period—\$4,884,000 in 1919, as against \$2,009,000 in 1915.



An Interpretation of British Wage Movements

Wages in England have more than doubled since before the war. Piece-work has not been accepted by most of the unions, and payment according to ability is difficult. The reasons for these conditions and the possibilities for future development are discussed in this article.

By Clarence H. Northcott

PERSONS familiar with British wage conditions prior to the war often concluded very rightly that human labor was too cheap and machinery too scarce. So far as labor is concerned, this condition has passed away. Something like a wage revolution has set in. Wages rates have risen greatly till they now stand at a level undreamt of in pre-war England. Nor have they yet reached their peak. Every day brings news of fresh demands some part of which will be granted in consequence of the advance in the cost of living. The result is an irritating instability in all those elements of business affected by increasing costs; an enormous pressure toward greater efficiency; great dissatisfaction as between various crafts, trades and grades of labor which have received unequal advances in rates; and a fruitless endeavor on the part of the workers to lower increasing prices.

An official calculation of the advance in wages up to March last suggests that wages for skilled workers were then double pre-war rates, while unskilled workers were receiving nearly three times what they previously received. Since then, large advances have been given in a number of grades. Thus, metal trades have received quite a 15 per cent increase, while carpenters and joiners have received two advances. The rates for skilled men in building trades are now nearly three times what they were, while unskilled men working with them are getting much more than three times their pre-war rates. The minimum earnings of mechanics and fitters are now 90s. to 95s., while carpenters get 97s., and their unskilled assistants 86s.

Specific illustrations will make the advance more distinct. In one factory where nearly 2000 men were employed before the war, the average time wage earnings for unskilled labor in 1914 were 30s. 6d., for 48 hours; in 1915, 33c.; in 1916, 35s. Next year a war bonus was given, bringing the average earnings for the year to 48s. After the armistice a national agreement covering the industry was drawn up, which raised the average for 1919 to 57s. 6d. for a 44-hour week. In January, 1920, an advance on the basic wage in the industry led the average time earnings for the first 4 months of 1920 to go beyond 65s. Piece workers in this same industry,

where no technical skill is called for, earn at the present moment an average of 80s., as against less than 32s. in 1914.

In skilled trades, similar advances have occurred. In pre-war days joiners, carpenters and bricklayers received, on an average, 11½d. per hour for an average week of 48 hours. In September, 1918, their rates were 1s. 2d. per hour, and in November of the same year 1s. 3½d. At the present moment they work a 44-hour week and are paid 2s. 2½d. in provincial centers, with 2s. 4d. in London. They have recently registered a demand for 3s. per hour in London. In the metal trades the average pre-war earnings of fitters for a work week

of about 54 hours was 38s. 11d. In September, 1918, the corresponding figure was 60s. 6d. By November of the same year it had become 65s. 6d. To-day it is 90s. and upwards for a 47-hour week. These low earnings relatively to skilled operatives in the building trades has led to a demand on the part of fitters for an increase of 23s. 6d. per week.

These advances have been brought about through several causes.

1. There has been a great scarcity of labor in many industries. The building trade is 200,000 men behind its labor needs. Sheet metal workers are at a great premium. In every industry, trade and occupation there is a scarcity.

2. Business has been good since the armistice. The purchasing power of the workers is greater, while an inflated currency has produced spend-thriftiness. Advancing prices have not checked demand. Profits are being made greater than ever before known in British industry and the workers are taking their toll.

3. The workers are better organized and employers are more conciliatory. There is a better, more healthy relation between capital and labor, and employers, protected by their strong federations against serious undercutting, are prepared to grant the demands for their workers for a reasonable wage.

The effects of these wage movements have been very far-reaching. In the first place, they have lifted the manual worker relatively to what is coming to be called the black-coated worker. Teachers and clerks are receiving relatively and, sometimes, absolutely lower pay. Adult men in the public schools of the country are receiving salaries lower than the wages of fitters and mechanics. Clerks of 25 to 30 years of age are often receiving less than the wages of bricklayers. Typists and

The more highly organized trades have been able to raise the wages of their unskilled workers above those of skilled workers in other lines of work. The building trades have done this, but other trades could offset their advantage in many cases if payment by results were accepted. Mr. Northcott points out, however, that the situation can never become stable until "The economic criterion and justification for increased wages are to be found in the relation of wages earned to effort put forth."

stenographers are fortunate if they get much more than the earnings of a competent female pieceworker.

From this incongruity there arises much unrest and dissatisfaction. The teaching profession is in a ferment and is organizing rapidly. Clerks are jaundiced and discontented, and are increasing the strength and militancy of their various unions. They are striking as determinedly as ever manual workers have done. In two instances known to the writer they have tied up engineering firms and compelled the acceptance of their terms. Skilled and highly trained mechanical draftsmen, whose standard wage is not more than 10s. to 20s. above a fitter, have formed a trade union, and, like the majority of the semi-professional workers just described, have gone over to socialism and the labor party.

Within the labor world itself great anomalies have arisen between trades. The building trade, by virtue of its monopoly, has obtained greater advances than other trades. In consequence, incongruities as great as those between black-coated and manual workers are repeated between skilled and unskilled manual workers. For instance, what are called builders' laborers, that is, unskilled workers assisting a skilled operative in the building trade, now receive almost as much as a skilled fitter and pattern maker. Sheet metal workers who, at best, are only semi-skilled men, are in greater demand than thoroughly trained mechanics. The same position has been duplicated in the case of the railway men. Recently, in seeking an advance, these men, whose rates were, and are, really below current rates, pointed to the high minimum recently obtained by the dockers, who secured 16s. a day as their basic rates. But the greatest anomaly of all is that which places in an inferior wage position men who have served a long apprenticeship that has equipped them with technical skill and capacity. The future of the metal trades will be clouded unless these craftsmen can get a proper wage to recompense them.

It may be said that the lower earnings in these trades are due to the failure of such craftsmen to accept payment by results. In part this is true, and the extent and significance of this attitude were examined in an earlier issue of this journal. The building trades have for long been opposed to payment by results in all its forms, and their high earnings at the present period are merely due to their monopoly position, in consequence of which they can charge all the market will bear. The metal trades have been troubled by the controversy over payment by results for nearly half a century. There are some districts and some sections of the workers in these trades that will not accept any form of payment by results. On the other hand, certain districts and certain sections are quite ready to accept piece work under specified conditions. Quite recently, skilled workers in the amalgamated metal trades refused after a ballot to accept payment by results. But this refusal was part of a diplomatic battle. The conditions of the employers as to the terms under which they would institute this form of payment were not acceptable. Hence, several persons present at the negotiations have expressed to the writer their opinion that what was rejected by the ballot was not the principle, but the employers' conditions. Almost at the same time the various unions of general workers comprising the unskilled assistants in metal and shipbuilding shops accepted piece rates under certain fair conditions. Piece rates must yield an advance upon time rates of 33 1/3 per cent and must not be cut except when processes have been really altered. Every such readjustment must not yield less than the previous rates had yielded. Conditions like these are what the skilled workers in the metal trades also would accept, provided, fur-

ther, that the installation and adjustment of piece rates were matters of collective bargaining, and the piece earnings were on a collective basis.

The iron and steel trades are strongly in favor of payment by results. An interesting statement on this matter, and on its effects, was made some time ago. In this John Hodge, M. P., the secretary of one of the leading unions in the trade, emphasized the preference of the iron and steel workers for payment by results, and stated the conditions under which so much success was attained:

"The rates once fixed have never been changed; it does not matter whether a new method of manufacture is introduced, and automatic machines or any other devices for increasing output adopted, the rate once set is never cut unless there be a change of practice or labor-saving machinery of a newer type introduced. The result has been that restriction has never been practised."

The example of this trade and the principles and procedure adopted therein demonstrate that British industry will be carried on to better advantage by a more liberal use of payment by results.

The new wage position has compelled much emphasis to be laid upon production. Wages higher than ever British industry has paid can only be realized out of the return from a production higher per unit and in the gross than any yet known. The employer is, therefore, striving to get production. He is demanding greater efficiency from individuals. He may have to tempt men to yield this efficiency by giving them higher wages. But he has at last broken loose from the bondage of a conventional standard of remuneration, and is ready to give a direct and assured reward to the worker who increases his output. In addition to demanding increased efficiency from individuals, the employer is strengthening his organization. He is setting out to stimulate, educate and reward his foreman and supervisory staff. He is somewhat afraid of too large an overhead spent upon supervision, but he is increasing machinery and is talking of mass production. In many cases, through works councils and shop committees, the workers are giving valuable suggestions and increasing output directly from the adoption of these suggestions.

Out of the ferment of the wage revolution above described has come the wider recognition of several wage principles:

1. Highly specialized craft skill, on which the reputation of British industry has been maintained in the past, is deserving of such a reward as will ensure the continued influx of such labor into industry.
2. Skill and effort alike must be rewarded in proportion to their degree. In several trades where a standard, or flat, wage is advocated by the unions in that industry, individual firms and individual workers are recognizing the injustice of this disregard for superior skill, diligence and capacity.
3. In the estimation of the extra return for superior skill or a higher degree of effort, justice and industrial content cannot be secured when the bargain has been one-sided.
4. The economic criterion and justification for increased wages are to be found in the relation of wages earned to effort put forth. What this relation is and what shall measure it are difficult questions. But only their solution will "iron out" the anomalies at present existing between clerical and manual labor, and between skilled and unskilled manual labor respectively.

Why Manufacturer Should Justify Himself to Workers

Generally speaking, as Mr. Tipper explains, it has been deemed sufficient for the management of a plant to justify itself to the stockholders, but in the changing of economic conditions and the newer education and aspirations of the workers, new conditions have arisen which the manufacturer should meet before the resulting consequences are forced upon him.

By Harry Tipper

A NUMBER of times in these articles I have referred to the necessity which the manufacturer is under to justify himself to his workers. One or two of the readers of these articles have asked me to amplify what I meant by this statement.

This necessity arises out of the suspicion and ignorance which exist in the minds of the workers in respect of the purposes of the management and the returns secured by capital as the result of the production. Added to the suspicion which exists as to the good faith of the management and the intention to deal justly with the situation, there is the lack of incentive or object in the work itself. There has just come to my desk from England a report from the General Congress of the various trade unions concerned in the cotton production in Great Britain.

One item of this report embodied a resolution requesting the government to appoint a royal commission to inquire into the costs and profits pertaining to the different branches of the cotton business; including the various specialized manufacturing branches and the various divisions of the commercial branches.

In making this report the Secretary of the Cotton Spinners Union made the interesting statement that the request was presented, not in connection with any proposed action as to increase of wages or any change in the wage situation, but because of the indignation felt by the workers that a few concerns and individuals should have been able to make such enormous profits during the unsettled period following the armistice; profits which the workers felt were unjust and without any just reason.

It has seemed to me many times that the average manufacturer does not realize how much of the strength of the organized movement of labor lies in the suspicion of injustice, and not in the desire particularly for a higher standard of living or a more responsible social position. It is not without interest that the main business of the agitator and the radical speaker is to call attention to the possessions of the other fellow and the things which he secures out of life, rather than to refer to the reasonable necessities of the worker and how he shall arrive at them.

It is not without some interest to the student that the news is largely concerned with featuring enormous profits, influence and possession, and all those things which accentuate differences and it is surely not without interest that the most of our literature, as supplied to the bulk of the population carries with it the lesson that the main object in life is to beat the other fellow and seize more than he has.

The worker is, for the most part, entirely ignorant of the object of his work, or the character of industrial organization and the intimate relation between the different elements which provide him with the necessities of life. Because of this ignorance, he is opened to all kinds of misinformation and most of his reading only emphasizes the differences without bringing any larger measure of comprehension as to the necessities.

The school education available to the worker is usually the most insignificant part of his education and has the least effect upon his ideas and influence. The newspapers, the surroundings, particularly in his growing years, the fiction which he reads, the movies and the speakers who talk to him in his own language are the potent outside factors in his education.

None of these provide him with any sound object in his work or any decent comprehension of the intimate relation between his work and his necessities. There is no indication that these elements in his education will be changed in the immediate future sufficiently to supply that need. The work which he is doing does not supply it ordinarily, because it is only a small part of a very complex process, the rest of which is entirely beyond his vision. All this perhaps might be neglected if this man's productive capacity were not governed by his mental attitude toward his work and toward the industrial organization, but the fact remains that the individual capacity for production is governed quite largely by the individual attitude of mind toward his work and the actions of the organized bodies which represent his collective desires, are in turn governed by the general demand which is residuum of agreement.

If it is necessary for the worker to work in order to live, it is far more necessary for the manufacturer to secure the maximum volume and quality of work out of the individual worker and this can be done only by changing the ignorance into knowledge, the suspicion into confidence and the fear into hope. It is in this respect that the manufacturer is called upon to justify himself to his own workers in his own shop. This statement is not academic or theoretical. In a sufficient number of individual cases, the manufacturer has justified himself to his workers to the point where their attitude of mind toward him has been changed and the results have been indicated before many years in the character and volume of the individual production.

The labor leader will freely admit this and will admit in confidence that there would be no particular problem in industrial relations, if industry generally were managed in the same way, but the labor leader will express

his conviction that these are the unusual managers of industry and they will always remain so small, in comparison with the total number in industry, that they will not be able to affect the result materially.

It is always necessary for the leader sooner or later to justify his leadership. So far in industry it has been considered sufficient for the leader to justify his leadership to the stockholders, but this will not continue to satisfy the conditions. The leader must be prepared to justify himself to his workers, otherwise they will refuse to work any more than they have to, and that is a long way from the maximum which can be produced.

The economic argument will tell and the industrial leader who has established a basis of confidence and knowledge on the part of his workers is now gaining sufficiently in increased production per man to place him safely beyond competition with other establishments where the management lack the same human foresight or moral understanding.

The ability to produce the same commodities with higher wages and higher material costs with less labor cost per unit is the desire of every production manager. Individual concerns in many lines of industry have accomplished this and they stand out in a very marked way by the character of this accomplishment during the restless years which we are passing through. Most manufacturers will acknowledge that these individual establishments have accomplished things when they are confronted with the facts, but they do not recognize the fundamental reasons for the accomplishment and are inclined to put the matter down as a better system or better equipment, a combination of mechanical and mathematical devices, or just a plain difference of luck.

They are not willing to admit that the human relations govern the economic results so closely, and that moral ideas of justice in business are both economically sound and practically advantageous.

When I have referred therefore to the necessity which is before the manufacturer of justifying himself to his workers, I have not referred to the moral or ethical necessity for it, but to the economic necessity, because the improvement in production economically must come very largely from the development of human relations so that the worker is inclined to concentrate all his energy and capacity upon the task.

The few men who have been wise enough to see the necessity for mutual understanding in the development of industrial production are being called here and there so that they are unable to do all the work which they are requested to do; not because the manufacturers and the labor leaders have become so much more concerned with the morals or ethics of the situation, but because the establishment of the moral basis of mutual understanding has so affected the economic results that these manufacturers have been obliged to recognize them. It will not do, however, to leave this important matter with a few who are making it a lifework, nor to the few managers who have been sufficiently gifted to see its necessity and operate thereon.

There must be a general comprehension in industry, that the manager or the owner must be prepared to justify his position; if he is to increase production efficiency, to eliminate interruption, to mitigate the organization developments which presently embarrass him, and to secure the full advantage of the individual capacity of each worker in his establishment.

Revision of American Standard Beams and Channels

IN 1896 The Association of American Steel Manufacturers adopted a list of standard profiles of structural steel sections which are known as American Standard Structural Sections. In 1911 the Association also adopted standard methods of computation for published weights and areas. The weights that were published for the minimum thicknesses of beams and channels did not correspond exactly to the published areas and it has long been known that it is impracticable to furnish these sections true to both the published weights and dimensions.

To correct this situation the Association has just adopted as American Standards the weights per foot shown in the third column of the table below for the sections of minimum web thicknesses which do correspond to the published dimensions.

Section	Depth, In.	Weight, Lb. Per Ft.	
		Present Weight	New Weight
Beams	3	5.5	5.7
"	4	7.5	7.7
"	5	9.75	10.0
"	6	12.25	12.5
"	7	15.0	15.3
"	8	18.0	18.4
"	9	21.0	21.8
"	10	25.0	25.4
"	12	31.5	31.8
"	12	40.0	40.8
"	15	42.0	42.9
"	15	60.0	60.8
"	18	80.0	81.3
"	20	55.0	54.7
"	20	65.0	65.4
"	24	80.0	81.4
"	24	80.0	79.9
"	24	105.0	105.9
Channels	3	4.0	4.1
"	4	5.25	5.4
"	5	6.5	6.7
"	6	8.0	8.2
"	7	9.75	9.8
"	8	11.25	11.5
"	9	13.25	13.4
"	10	15.0	15.3
"	12	20.5	20.7
"	15	33.0	33.9

There is to be no change in the profiles and properties of sections of minimum web thickness nor in the weights and properties of the intermediate and maximum sections of American Standard Beams and Channels.

The new weights were put into effect Sept. 1 by all of the companies rolling these sections.

Most Advantageous Connecting Rod Section

(Continued from page 477)

A slight error seems to have crept into the tension formula on page 1255. This should read

Max. tension force = $A [.00034 r N^2 w (1 + n) + p]$ lb.

where A = piston area in sq. in.

r = crank radius in feet.

N = R.P.M.

n = ratio of crank radius to rod length.

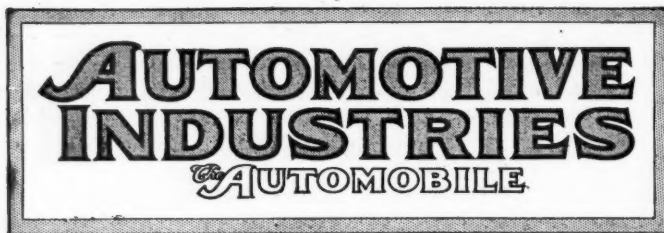
p = pressure in lb./sq. in. in cylinder at beginning of suction stroke.

w = reciprocating weight in lb./sq. in. of piston area.

Using values of $w = 0.5$ lb. (a common value for cast iron pistons) and $p = 5$ lb., the value of the tension force given in the original article will be seen to be verified.

GUSTAVE WIEDEMAN.

IF you have not received your copy of the Index to Vol. XLII of AUTOMOTIVE INDUSTRIES, send for it now. It points to a wealth of information.



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Automotive Industries—The Automobile is a consolidation of The Automobile (monthly) and the Motor Review (weekly), May, 1902, Dealer and Repairman (monthly), October, 1903, and the Automobile Magazine (monthly), July, 1907, and The Horseless Age (semi-monthly) May, 1918.

New Service Point

GOOD service is grossly underestimated by most manufacturers but perhaps no manufacturer ever appreciated the fact that excellent service would become a factor in selling his car because of an annual tax law. That is now the case in England. The new license measure is so severe that arrangements are made for remission of taxes for months when the owner is not going to use his car. In this connection, objection is made by owners against taxing them for periods when their cars are "in the shop." It is explained that English make cars are "in the shop" for such long periods, when repairs are required, that the loss under the annual tax fee is an appreciable proportion.

Here is where the American cars, which are serviced to the American standard in England, are gaining a distinct advantage. Most American cars are never "in the shop" except for very short periods. This advantage is a very good counterweight to the prejudice aroused against the left hand drive and the sentiment in favor of home manufactured vehicles.

Standardization of the Differential Gear

STANDARDIZATION of machine parts naturally proceeded from the simplest elements, such as screw threads, and gradually extended to more complicated structures. The line along which the S. A. E. Standards Committee has mainly worked seems to be to standardize all those parts of automotive units which must fit to other units that are generally made in other plants. For instance, in the case of the magneto the height of the shaft axis above the base is specified, as the engine designer must have this dimension in order to be able to locate his magneto bracket. Similarly, the dimensions of the magneto shaft end are specified because the driving coupling must be designed to fit the shaft end.

During the early stages of the automobile industry the differential gear was generally made by the car manufacturer. It was not a patented device, there were none to be purchased in the market, and if one wanted to get it from outside his own plant it had to be made to order. But at present a great many differential gears are made in plants specializing on this part, the advantages of specialized manufacture being such that a car manufacturer, especially one with limited resources, can better afford to get such parts from outside than to make them himself.

The differential may therefore be regarded as the product of a specialized industry, the same as the carburetor, magneto, etc., and it is highly desirable that at least those parts of it which must fit other parts should be standardized. This includes all dimensions of the flange and of the housing supporting hubs and of the side gear hubs. But if we go this far we can probably go one step further and standardize the whole design. We are referring here, of course, only to the regular three or four pinion bevel gear differential, which is used on such a large percentage of cars, and not to the special types designed to obviate stalling due to loss of traction at one wheel. Three and four pinion bevel differentials have now been in use on automobiles for more than twenty years, and if those members of the S. A. E. who have specialized on this device could be formed into a division of the Standards Committee it should be possible to get up a standard design which would leave very little room for improvement. With not more than six sizes the whole range of requirements, from light passenger cars to heavy trucks, could be covered.

We are not sure whether the manufacturers of differentials are very keen for standardization. For most of them it would mean a change in design and a change in some of their equipment, and such changes are always annoying. However, these makers are constantly being called upon to make differentials which differ only very slightly from models they are already making. They would much sooner furnish the customer a model for which they are already tooled up, but owing to the design of parts adjacent to the differential this may be impracticable. Standardization would eliminate this unnecessary multiplication of tool equipment and save expense. It is bound to come.

Snow and Truck Sales

EVERY motor vehicle manufacturer who sells his products in the markets in the northern part of the United States or other cold climate must, perforce, be interested in the problem of snow removal. The complete success of the motorization of highway traffic for industry, or the motorization of farms, rests on the success of maintaining an all-year traffic. Any transportation plan that permits of a period of idleness from one week to four months cannot be successful.

It is an unfortunate fact that in many sections of the United States the owner of the truck expects and plans to lay up his truck for a certain period because he believes that it cannot be used when deep snow lies on the ground.

This is not—and cannot be—considered a local problem. The activity of a truck is not a local problem, as you will quickly realize when you compare the travels of a single truck with territory of the dealer who sold the vehicle. Truck traffic, to be successful, must not be held within the confines of the small community. It must be interurban. Dealers are being urged to sell trucks on this basis and they are doing it. What would we think of a railroad service that deliberately planned to desert such a service for several weeks each year?

The secret of success of the idealized truck traffic is day-by-day service that is not halted by weather or other local conditions. It is admitted that there are snowfalls in many sections of the country that the truck—playing a lone hand—cannot compete with. Then, of necessity, the snow must be removed from the path of the truck, so that it may go on its way at effective speed daily. A long step forward can be taken by education of the truck owners as to the possibilities of their vehicles combatting the lighter snowfalls, but this work often is unduly severe on the truck.

The next step is snow removal. That should be done under municipal and state direction, if we are to avoid the calamity of truck idleness we witnessed last year. As a rule municipal street commissioners and state highway commissioners well know the problems before them and are ambitious to fight this menace with a winning battle. But they all tell you that they gain no encouragement from business; that to a very great extent business—and especially the public—appears to regard snowfall as one of the blessings—or curses—of nature that must be tolerated. The same attitude once prevailed as to rains, but sewers and levees have been built and rain is now robbed of much of its power for damage. Snow is still running riot, its terrors merely being added to by the advances of civilization, as the highway cuts and other improvements in our roadways facilitate the formation of drifts.

Within recent years some northern states have demonstrated that by State action certain highways can be kept clear. True, the cost of this work appears heavy, but it is small compared with the loss of business that would result from idle traffic. Last year New York City lost, it is estimated by the Merchants' Association, \$60,000,000 because of snow delays. There was spent \$5,500,000 in an ineffectual fight against this snow. The fight was a failure because the battle had not been planned and because effective equipment was lacking.

This awakened business and now New York City is spending an adequate amount for snow-fighting equipment and is planning the battle. This situation is the basis of a series of articles prepared by *Commercial Vehicle*, one of The Class Journal group of papers. These articles are directed especially to fleet owners, who are readers of that paper, but they effectively point out to the manufacturer, the distributor and the dealer the problems that are before him if he would level the sales hill that is before him. The snow fighter can never win his battle if he does not have the support of big business, the source of the taxes that must pay the cost of the battle. The fleet owner probably has the most directly at stake on the particular days of idleness, but the manufacturer has the biggest stake in the game from year to year.

The question resolves itself back to this simple statement:

Motor vehicles can never be classed entirely essential if the community can get along without them when the snow lies on the ground.

Receiverships Need Not Cause Fear

Do Not Forecast General Epidemic

Bethlehem Motors Involves No Others—Standard Parts Due to Family Row

NEW YORK, Aug. 30—Receivership for the Bethlehem Motors Corp. caused something of a flurry in circles outside the automotive industry, but there is no substantial reason for taking it too seriously. As a matter of fact it was perhaps less significant than would appear from surface indications. The plant will remain in operation and there undoubtedly will be a reorganization of the company. The banks, which have claims of \$1,700,000, have no intention of losing their money. The difficulties of Bethlehem Motors have no ramifications, so far as can be learned, and no other companies are involved in any way.

There is even less reason to feel alarm over the Standard Parts receivership proceedings. They are not the result of present financial and business conditions but rather the outgrowth of a family row which had its inception months before the Federal Reserve Board forced the readjustment process. While finances are involved in the Standard Parts litigation, they are incidental to a fight over the control of the property. The showdown might have come, no matter what general business conditions were. There is no reason, therefore, to regard this case as symptomatic.

Unbalanced Inventories Main Cause

It has been pointed out repeatedly by AUTOMOTIVE INDUSTRIES that failures would follow in the wake of the post-war readjustment which is now going on. There have been several of them, and there probably will be more, but there is no especial reason to fear an epidemic. In almost every case they have been due to the fact that the companies involved were caught with large but unbalanced inventories when credit lines were shortened and transportation troubles became acute. It became almost impossible to get essential parts or the cash required to carry the plants until completed units could be sold.

Companies which were able to get along until they could shorten sail by converting inventories into cash and reducing operating expenses in every possible way will be able to reach harbor safely unless they have particularly hard luck. There probably is less rea-

son for perturbation in the industry to-day than there was a month, or even two months, ago. Many companies which were in a somewhat precarious position have re-financed themselves successfully, and others probably will succeed in doing so.

The automotive industry is much sounder fundamentally than it was when the Federal Reserve Board determined the time had come for deflation.

Dozens of ambitious expansion plans have been nipped in the bud, and this is by no means an unmixed evil, for the factory facilities already available doubtless will be ample to meet the normal demands for some time to come. The increased production, which would have been possible with larger plants, would have found no immediate market under any conditions as soon as the cumulative demand piled up by war had been satisfied. It is doubtful if it would have paid for the factory extensions even if there had been no slump.

Outlook Is Encouraging

In numerous instances the cash which might have gone into plant enlargements has been diverted into working capital at a time when cash in bank is most essential. This is a sound condition and works for the ultimate good of the industry.

One highly significant fact has developed of late which should allay the fears of those who are apprehensive over the future. It is to be found in the fact that the banks have shown no disposition to desert the automotive industry as it is represented by the manufacturing end. There is evident no intention of deserting the ship.

Quite the contrary is true, in fact. At least three powerful New York groups are appraising conditions carefully, and one of them, which already is heavily interested in automobiles, is investing still more heavily. The Morgans waited until the slump came to get into General Motors. A third group, more powerful than either of the others, is prepared to invest huge sums in the industry.

PRESTON PLANT OPENED

BIRMINGHAM, ALA., Aug. 28—The new factory of the Preston Motors Corporation in Vanderbilt Road, Birmingham's newest industry, was opened to the public with a big reception. The company will manufacture three models, a small four, a six cylinder car using the Falls motor, and a special model equipped with Rochester-Duesenberg motor. Bosch magnetos are used throughout, along with Timken-Detroit axles, Borg and Beck clutch, Zenith carbureter, Bethlehem spark plugs and Firestone tires.

Ford's University To Confer Degrees

Regular College Courses in Engineering Will Be Given Employees

DETROIT, Aug. 27—With a course of study equal to that of any technical institution or university in the country conferring degrees in mechanical, electrical and chemical engineering, the Ford Technical Institute for higher education of Ford employees will be opened this fall. Announcement of this latest move in the campaign for the betterment of the educational advantages of Ford employees was made by Edsel Ford.

The plan to open the institute with university rank and degrees has been under discussion for some time between Henry and Edsel Ford and Superintendent Searle of the Ford educational department. The manufacturer contends that the system in vogue offering academic and English courses and the service school for employees of dealers needs but the courses in the higher technical branches to put students in the front rank of the profession.

It is pointed out in the announcement that the students will not be dependent on meager equipment, but that millions will be expended in making the institution the equal of any in the land.

The institute will be open to every Ford employee, an approximate total of 100,000, including automobile, truck and tractor employees, railroaders, lumber camp and saw-mill employees, and the miners that are working in the Ford property in Kentucky, as well as those who will be engaged in the development of the huge tract in northern Michigan which is declared rich in ore.

Complete details regarding the opening and the corps of instructors are expected within the next two weeks.

SMALL IN BANKRUPTCY

INDIANAPOLIS, Aug. 30—An involuntary petition in bankruptcy was filed at Frankfort, Ind., Saturday, against the William Small Co. of this city by the Warner Malleable Co. and the Hoess Co., both of Hammond, Ind., and the Columbus Bolt Co. of Columbus, Ohio. Their petition says their claims against the Small company aggregate \$7,890, and that an act of bankruptcy was committed when William Small, head of the corporation, filed a receivership petition in Superior Court last week. The Union Trust Co. was appointed receiver in the bankruptcy proceedings. Small asserted that his company had assets of \$1,900,000 and liabilities of only \$900,000.

Elgin Race Teaches Designing Lessons

Amazing Performance of Small
Engines Shows What Can
Be Done

By ROY E. BERG

(Technical Editor of Motor Age)

ELGIN, ILL., Aug. 28—Considered from the standpoint of mechanical reliability, the eighth annual road race held on the Elgin course to-day was the most remarkable performance ever witnessed on any track in this country. Only one pit stop was made. Piston displacement was limited to 183 cu. in.

The race was won by Ralph De Palma in a Ballot car. He covered the 250 miles in 3 hours, 9 minutes and 54 seconds, establishing a new record for the course and breaking the lap record made in 1913 by Wishart in a car of 300 cu. in. piston displacement.

The only pit stop was made for trouble caused by a clogged gasoline line on Gaston Chevrolet's Monroe. This stop delayed the green car seventeen minutes and ten seconds. On the twenty-ninth lap, with but one more lap to go, the same car made a second stop of thirty seconds' duration, during which a gallon of gasoline was taken on. Other than these stops every car went through the race from start to finish without mechanical trouble, electrical or other mishaps. Neither did any car stop for gasoline, water, oil, tires, nor for instructions, with one exception, and here the human element entered and a driver was replaced. Joe Thomas, who had suffered severe injuries during the practice trials, was not physically able to withstand the severe grind and Tom Alley took the wheel for him.

Pit Men Kept De Palma Informed

One of the features of the race was the manner in which De Palma took the lead at the very beginning and held it continuously throughout the full thirty laps. The means which enabled him to maintain his lead with such great regularity bears discerning interest. De Palma's lead, which was never more than two minutes and once was reduced to three seconds, was made possible primarily, of course, by efficient driving, but the foundation upon which the driving rested was the manner in which his pit-men kept him informed of his position.

It often has been said that a race is won from the pits, and this was undoubtedly true in to-day's race. It is not possible for a driver to keep track of his position and the position of his opponents, which is the duty De Palma assigns to his pit managers, and by conveying this information by means of large letters on a blackboard to him as he passes he is enabled to gain a few seconds if his lead is alarmingly reduced.

This was the first road race to be run

with the 183 cu. in. engine. Five years ago an engine of over 300 cubic inch displacement, driven by Spencer Wishart, made a track record of six minutes and seventeen seconds, which has successfully withstood the attacks of all drivers since, until the small engine reduced it to 6 min. 9.7 sec. Considering the great difference in engine speeds between the larger engine of that time and the small engine of to-day, it illustrates the great strides which have been made in structural design. Traversing 251 miles at better than 75 miles per hour with the engine turning up at speeds well above 3000 r.p.m., and this on an average con-

How Drivers Finished In Elgin Road Race

First—Ralph De Palma, Ballot.
Second—Tommy Milton, Duesenberg.
Third—Jimmy Murphy, Duesenberg.
Fourth—Ralph Mulford, Monroe.
Fifth—Eddie O'Donnell, Duesenberg.
Sixth—Percy Ford, Frontenac.
Seventh—Tom Alley, Revere.
Eighth—Gaston Chevrolet, Monroe.

ditioned road, gives a comparative idea of the advances made in construction.

Piston speeds in these engines are approaching rates at which it was thought only peripheral velocities of rotative members could attain. Since this year is the first in which the 183 cu. in. engine has been used, it is hardly to

(Continued on page 489)

Wide Range Shown in Car Price Raises

DETROIT, Aug. 28—The following is a comparison of price increases during the period between Aug. 12, 1918, and Aug. 12, 1920, with the percentage of increase as issued by a local manufacturer:

		Per Cent
Buick 6	\$530	or 42
Cadillac 8	970	or 33
Chandler 6	300	or 19
Chevrolet 4	135	or 19
Cole 8	655	or 27
Dodge 4	300	or 30
Dort 4	160	or 17
Ford	200	or 44
Franklin 6	745	or 30
Haynes 6	805	or 43
Hupp 4	335	or 25
Liberty 6	500	or 34
Maxwell	330	or 40
Mitchell 6	400	or 30
Nash 6	380	or 27
Oakland 6	345	or 33
Oldsmobile 6	255	or 20
Paige 6	275	or 20

HOTEL FOR EMPLOYEES

MUSKEGON, MICH., Aug. 28—Campbell, Wyant & Cannon Foundry Company has remodeled the Heights Hotel for its workers to relieve housing conditions. The company also has an option on another large building which it is proposed to remodel into a hotel for its employees.

Berlin to 'Frisco Zeppelins Building

Huge Aircraft Designed to Make
Trip in 4 Days—Start
Next June

AKRON, Aug. 30—Germany is planning a Berlin to San Francisco aerial service with two huge Zeppelins which are now being built at Friedrichshaven, according to John R. Gammeter, aeronautical expert of the B. F. Goodrich Co., who has just returned from a trip to Europe for the company.

The huge airships, which he said are larger than any hitherto attempted, will be designed to make San Francisco the fourth day out from Berlin. Stops will be made at Paris, New York and Chicago. Hamburg-American Steamship Co. interests are said to be financing the project. The American Ship & Commerce Corp., backed by powerful American interests, recently entered into a trade alliance with the Hamburg-American line.

Sauer, a widely known Swiss truck maker, is building Maybach motors for the great airships. These motors always have been used in Zeppelins, for which they are especially designed. In talking with Gammeter about the new enterprise, Sauer told him the ships would carry 30 tons, including freight and passengers. The passenger compartments will be luxuriously fitted.

Arrangements now are being made by American backers for landing places and hangars in this country. It is planned to make the first trip in June of next year.

Gammeter declared the projected aerial service would awaken this country to the possibilities of air transportation. He said his trip abroad had shown him that the United States is far behind European nations in developing aircraft. England leads all other countries in heavier than air developments, and Germany in lighter than air. Expense is not spared, Gammeter added, and regular aerial lines are in daily operation between many cities.

It will take the United States years to catch up with Europe in aeronautical developments, Gammeter asserted.

PHILIPPINES BUYING CARS

WASHINGTON, Aug. 28—Reports of the Insular Collector of Customs for the Philippine Islands show that automobiles and automobile parts were included in the principal imports. The number of automobiles imported for the calendar year 1919 was 2557, as compared with 1911 in 1918, 1237 in 1917 and 986 in 1916. All motor cars were purchased in this country. The value of all automobile equipment, including parts, amounted to 9,604,649 pesos, as against 6,525,665 pesos in 1918, an increase in valuation of 47.2 per cent, constituting 4 per cent of the total imports.

Working Out Plans To Save Bethlehem

Merchandise Creditors Will Work With Bankers—Outlook Hopeful

NEW YORK, Aug. 30—At the request of attorneys representing the banks which have claims aggregating \$1,700,000 against the Bethlehem Motors Corp., the Motor and Accessory Manufacturers Association has appointed a merchandise creditors' committee to co-operate with the bankers' committee in working out plans for the continued operation of the plant and the protection of all persons with claims against the company.

The representatives of the merchandise creditors, who have claims aggregating \$600,000, will be Alexander W. Copland, president of the Detroit Gear & Machine Co.; Harry Barit, assistant treasurer of the Detroit Pressed Steel Co.; Charles H. Burr of the S-K-F Industries, I. K. Schnaitter of the Willard Storage Battery Co., and S. S. Meyers, general counsel of the Motor and Accessory Manufacturers Association.

The merchandise creditors' committee now is receiving assignments of claims, and when this work is completed will confer with the banks' representatives to map out a plan of operation.

Assets Exceed Liabilities

The affairs of the Bethlehem Motors are not in any sense in a hopeless tangle for its assets exceed its liabilities in the ratio of 5 to 3. There is every reason to believe it can be brought safely out of its troubles. Reorganization plans already are under way, but have not been worked out in detail. Arrangements have been made, however, to take care of the pay roll and operations in the plant will be continued.

It now seems probable the banks already involved will work out a permanent financing plan which will assure new working capital adequate to meet present needs. The products of the company have enjoyed a ready sale and bear a very high reputation. There is no reason to doubt a market can easily be found for all which can be made.

Difficulties of the company result directly from inability to finance maturing obligations. This was due to tight credit, railroad congestion, unbalanced inventory and over-extended production schedules together with the use of too much cash along expansion and experimental lines.

The Bethlehem Motors Corp. was organized in June, 1919, by interests representing the Chase National Bank and Allan A. Ryan to take over the Bethlehem Motors Corp. of New York and North American Motors Co. of Pennsylvania. The new company had no debts and nearly \$1,000,000 in cash for working capital. About six months later it needed another \$1,000,000 additional

cash to enlarge and combine the plants. When Ryan refused to supply the money needed the company increased its capital to 200,000 shares of no par value stock and sold 43,334 shares to stockholders at \$28 a share, thus raising the funds needed.

Ryan sold his interests early this year and resigned as a director, together with S. C. Potter and L. Sleiger. C. R. Ford and H. F. Harris were added to the board. Harris took over the management of the plants as president of the company, but he retired some three months ago and A. T. Murray returned to the presidency with C. E. Wood as general manager. Wood is now the receiver.

Ford Will Expand Plant in Louisville

LOUISVILLE, Aug. 28—Duplication of the Ford Motor Company assembling plant at 2500 Third Street has been ordered immediately by headquarters in Detroit, it was announced to-day by J. S. Keown, manager. Architects for the company were here yesterday afternoon to obtain a building permit and discuss plans with local officials at the Ford plant.

A total working floor space of 88,000 sq. ft. will be available in the completed building. It will be four stories high and 400 by 100 ft., occupying practically all the two and one-third acres on which the plant is located.

Assembling of farm tractors will be the principal addition feature in the new building. One hundred tractors will be turned out daily. At present none is made here. The capacity for turning out cars will be more than doubled. Two hundred daily is the goal set, while now the number is only eighty-five. The number of employees will be more than doubled. Two hundred men are employed at present.

MERGER PLAN APPROVED

PHILADELPHIA, Aug. 27—Stockholders of the Hale & Kilburn Corporation, of this city, to-day voted to accept a proffer from the American Motor Body Co. to purchase all the assets, including the plant and business of the corporation, in exchange for preferred and common stock of the American Motor Body Co., which is assuming all the liabilities of the Hale & Kilburn Corporation. The new company will combine the plant and business of the Hale & Kilburn Corporation of this city and the Wadsworth Manufacturing Co. of Detroit.

ANOTHER BRITISH MERGER

LONDON, Aug. 20—Acquisition by Agricultural and General Engineers, Ltd., of Henry Bessemer & Co., Ltd., of Sheffield and Bolton, is the trade event of this week. The fusion is both important and interesting, as the story of Bessemer's is a landmark in the history of the development of steel making. The authorized capital of the Bessemer company is \$2,000,000.

Uniform Traffic Code Is Delayed

National Convention Finds More Time Needed to Draft Model Law

SAN FRANCISCO, Aug. 28—With hundreds of recommendations in hand as the result of a week of committee and general meetings, the national traffic officers convention adjourned yesterday without having formally adopted a uniform traffic law for the various States.

So many and so varied complications arose in the course of drafting the law that the traffic experts decided several months would be needed to codify the proposed regulations and put them into final form. A special committee of nine was named to work to this end and report to the executive committee at Cleveland, Dec. 2.

Many of the proposals for the uniform code were submitted by the California Automobile Trades Association, which held meetings in conjunction with the traffic officers convention. Robert W. Martland, state secretary of the association, has been made a member of the special drafting committee. Other members are W. H. Maltbie, Baltimore; Percy Towne, San Francisco; David Van Schaack, Hartford; E. W. Braun, Chicago; David R. Faries, Los Angeles; Dr. Clayton Sharp, New York; J. E. McCurdy, San Mateo, and J. B. Monohan, San Francisco.

Lieut. Daniel A. Sylvester, head of the San Francisco Traffic Bureau, was re-elected president. Chicago won in the contest for the next convention, defeating Buffalo and Minneapolis.

The uniform traffic code which will be drafted will be presented to the Legislatures of all the States. If automotive interests are successful in bringing about general acceptance of the law, the same regulations will prevail in all parts of the country and the present crazy-quilt patchwork of laws which govern the nation's motoring activities will be shelved for all time. Motorists then may cease to worry about constantly changing rules of the road, which make him constantly liable to arrest.

International significance was given to the convention by the attendance of large Canadian delegations. The representatives of the Dominion will try to obtain the passage in Canada of a code similar to that which it is hoped to have adopted here.

RUBBER PLANT SOLD

BUCYRUS, OHIO, Aug. 30—The Bucyrus Rubber Co. has sold its plant here to the C. M. French Rubber Co. of Cleveland, recently organized with a capital of \$1,500,000. Both fabric and cord tires will be manufactured. C. M. French of Cleveland, president of the company, has had wide experience in the tire field. The new company expects to be in production before winter.

Special Cables

Big Price Cuts Made by Ford in France

Car Now Lowest Priced on Market—"Folded Arms" Strike in Italy

(By Cable to AUTOMOTIVE INDUSTRIES)

PARIS, Aug. 30—Henry Ford, following the course he already has set in England, has announced a big cut in the prices of cars sold in France. Two seaters without electric starters will sell hereafter for 13,200 francs and with starter for 14,300 francs. The price of 4-seaters without starter will be 13,600 francs and with starter, 14,800 francs. This makes the Ford car the lowest priced on the French market. The nearest French competitors are the Renault which sells for 20,000 francs and the Citroen at 18,000 francs. It is believed here this cut by Ford will force French makers to reduce their prices, especially in view of the fact that the market is very dull at present.

Frederich, driving an Alsatian built Bugatti, won the international light car race at Le Mans yesterday for machines limited to a piston displacement of 85 cu. in. His time for the 255 miles covered was 4 hours, 37 minutes, 46 seconds, giving an average of 57 miles an hour. Nouguet was second in a Bignan-sport, 20 minutes behind the leader. Bugatti would have won the first three places but for the fact that near the end of the race one of the drivers was disqualified because an outsider unscrewed the radiator filler cap.

The Italian Federation of Mechanics has decided to undertake a "folded arms" strike and remain in the shops until they are driven out by force. This movement will involve all Italian automobile factories.

A semi-official statement issued by the Berliet Co., while admitting the present serious condition of that concern, claims financial assistance has been obtained in France and that work is proceeding normally. It is added that an important contract for trucks has been received recently. The statement also is made that several thousand ball bearings, which were scrapped because of imperfections, thus holding up production of the new low-priced car, were not of French manufacture.

BRADLEY.

General Motors Will Exploit Side Lines

NEW YORK, Aug. 30—The General Motors Corp. proposes to erect two new

plants on a 60-acre site purchased early this year at Grand Rapids. One will be for Frigidaire refrigerators and the other for Sunny Home electric power plants. The plan marks another step in the company's determination to greatly increase its income from sources other than the sale of passenger automobiles. Announcement was made some time ago that preparations were being made for a very material increase in the production of motor trucks, tractors and agricultural machinery. The output of refrigerators ultimately will reach 100,000 a year, which would mean a gross business of \$40,000,000.

Sales plans for the Delco light systems, also manufactured by a subsidiary of General Motors, provide for their introduction in all parts of the world. There already are 125 distributors outside the United States. The Sunny Home light system is less expensive than the Delco, and no announcement has been made as to the extent to which it will be developed.

Hope to Take Allen Out of Receivership

COLUMBUS, OHIO, Aug. 30—Substantial progress is being made in working out a plan which contemplates lifting the receivership of the Allen Motor Co. and it is probable application soon will be made to the courts to take this action.

So confident are they in the future of the company that the preferred stockholders and the banks which have claims for loans, that three-fourths of the signatures necessary have been obtained to an agreement for a preferential loan of \$500,000, which would be used as working capital to work up the inventories on hand and put the company on its feet. This loan will constitute a first lien upon the assets but it will not be designed as permanent financing.

There has been a growing feeling on the part of the persons interested that application for a receivership was premature and it has been demonstrated that the company can easily be made solvent if funds can be provided to permit a continuance of operations.

Big August Business Is Reported by Reo

LANSING, MICH., Aug. 28—The report of Reo Motor Car Co. for August will show that the production and sale of cars and trucks during August exceeded any month since the war, according to a statement made by Vice-President R. H. Scott.

The volume of business done by Reo, in point of dollars and cents, Scott said, will exceed that of any month in the history of the company. Still more significant is the statement that dealer estimates and orders for September indicate that the coming month will be greater than August in point of production and the output will be limited solely to the capacity of the factory.

Elgin Race Teaches Designing Lessons

(Continued from page 487)

be expected that development of these small jobs has reached its ultimate stage. The engines are truly wonderful, and further development seems hardly possible. Chassis development is undoubtedly going to receive more and more attention.

Among the improvements which will result and be reflected in stock passenger cars from road racing of this kind will be spring construction, chassis balancing, rear axle construction, and lastly, but of great significance, front wheel brake application. At the close of the race it was noted on several of the finishing cars that the oscillation on the spring shackle bolts had been so violent that the bolts were hot to the touch. In fact, they were warm when compared to the tire temperature which was extremely low for the grind the tires had endured. Whether or not there will be a departure from the leaf spring it would be improper to state, but if developments which are taking place at present are any indication, coiled springs held within telescopic tubes may be seen in general practice.

Together with the spring development will come better balancing. It was noticed how many of the cars clung to the road at speeds around 80 miles per hour. Bumps, hills, curves and other undulations in the road seemed to have no effect on the manner in which the cars rode. Every effort seemed to be transformed into forward motion. Side swaying was hardly perceptible. By applying to stock cars lessons learned from such trials, the industry will make great progress.

Superiority of Four Wheel Brakes

Very noticeable was the difference in speeds maintained by those cars having four wheel brakes and those with brakes on the rear wheels only. Every car equipped with four wheel brakes had the decided edge on the others. In fact, the first three cars to finish had four wheel brakes. At present one American concern is completing its design for brakes of similar construction on stock cars. It is proven that four wheel brake equipment permits a stop in less than half the distance, as compared with rear wheel brake equipment.

When the development of these small cars has approached the point where further increase in speed and efficiency seem to taper off to the flat part of the curve another reduction in engine size may be expected. This evolution undoubtedly will bring out the two liter engine, which has a piston displacement of only 122 in. As it is, the present engines are only 7 per cent larger in piston displacement than the Ford engine, but the horse-power development is over 90.

As the engine size decreases the quality of workmanship must increase in order to produce efficient results.

Indianapolis Slump Much Exaggerated

Investigation Shows Press Association Distorted Curtailment of Production

INDIANAPOLIS, IND., Aug. 28 — Stories to the effect that "tightening of money by banks will force a suspension of the automobile industry in this city within a short time" are refuted by the Indianapolis Automobile Trade Association, which has just completed an extensive survey of conditions in the business.

Without exception, heads of automobile factories declared that rather than face a shutdown because of the tight financial conditions they are expecting to continue production straight through the winter. Several said that instead of seeing a calamity in the cessation of the era of free and easy handling of "automobile paper" by the banks they foresee the establishment of the industry upon a firmer basis than ever. Being faced with the necessity of operating upon a narrower margin the business will now plant its feet upon solid rock and conduct itself along the more conservative lines followed by the older industries, they said. This will result in a stability which could have been attained only by "going through the fire."

A dispatch sent from Indianapolis several days ago by the Limited Press included these words:

"Thousands of employees of the auto factories of this city have already been laid off and the forces are being reduced still further."

Survey by Trade Association

The survey of the Indianapolis Automobile Trade Association, which included examination of payrolls so as to make certain that facts gathered were authentic, has proven this assertion to be absolutely untrue. The manufacturers make no bones of the fact that they have reduced their working forces, but none of the eight principal factories of the city has laid off as many as 1000 men, while it is doubtful if the total number of men dismissed by all will reach this figure.

A statement in the dispatch that the Nordyke & Marmon Company has released "2000 of its men, retaining a working force of 3800," is without foundation, since the company's payrolls show that there were in its employ on Jan. 1, 1920, and on Aug. 1, 1920—a reduction of only 236.

Some of the other big companies have made reductions of about the same size, while others, who three or four weeks ago laid off part of their men, are now taking them back upon a 100 per cent scale.

Sound business reasons are behind the slight reduction in forces in every instance. Some of these factory heads, goaded to the limit of production for

almost three years, have known for several months that their stocks were so badly out of balance that a part of their working force was standing idle while another part was working at top speed. Accordingly when they saw a slackening in demand coming as a result of the banks refusing to deal in "motor paper," and being confident that the underlying demand is as good, or more solid than ever, they seized the opportunity to balance stocks so as to be in good shape for the harvest to come.

The other manufacturers, while influenced by the above consideration to some extent, saw an excellent opportunity to prune the "culls" from their working forces. It is no secret in Indianapolis that the labor market has eased so that automobile men are able to be choosers as well as payers once more.

What is perhaps more indicative of the sound condition of the industry in Indianapolis than anything else is the fact that two new factories are going right ahead with their building operations, one upon a \$1,000,000 scale.

None of the manufacturers see a slackening in normal demand. They do, however, see the approach of the time when automobile salesmen are going to have to actually "sell" cars, believing that the old days when all that was necessary was to sit in a showroom and wait on customers who come in of their own free will, are rapidly passing.

Denies G. M. Seeks to Elect Governor

DETROIT, Aug. 28—F. B. Leland, candidate for the Republican nomination for Governor, in a speech last week declared General Motors Corp. is attempting to elect one of its directors Governor. The attack, which has created much comment in automobile circles, was made in an address to Hudson Motor Co. employees and referred to the candidacy of C. S. Mott of Flint. A vigorous statement resenting the attack was sent out from Mott's headquarters denying all ulterior motives on the part of General Motors and declaring that corporation has proved a great asset to every Michigan city where its plants are located and challenged Leland to show where the corporation had in any way attempted to dictate labor or other policies in any community.

AMERICAN EXHIBITS SOUGHT

CHRISTCHURCH, NEW ZEALAND, July 25—(Special Correspondence)—The Olympia motor exhibition will be held here Nov. 6 to 13. The managers will provide 40,000 sq. ft. of floor space and the show is expected to surpass any previously held in the southern hemisphere. The exhibits will include passenger cars from England, the United States, France and Italy, as well as trucks, tractors, motorcycles, tires and accessories. The manufacturers are particularly anxious to arrange for a representative display from America.

Steinmetz Motors Buys Tioga Tractor

Plans Production of 20 Weekly, at Baltimore—Experts Join Staff

PHILADELPHIA, Aug. 28 — The Tractor Division of the Taylor-Wharton Iron & Steel Company, known as the Tioga Mfg. Co., owner of all Tioga tractor patents, has been sold to the Steinmetz Electric Motor Car Corporation of Baltimore, Md., a corporation recently organized to produce electric trucks under the patents of Dr. Charles P. Steinmetz, chief consulting engineer of the General Electric Company, of Schenectady, N. Y.

Tioga tractors will be built hereafter at the just-completed Baltimore plant of the Steinmetz company. The production for the first year is planned on a scale of twenty tractors per week. The transmissions and rear axles, of special Tioga design, and under Tioga patents, will continue to be built in Fond du Lac, Wis., by the Fond du Lac Machine Company, a subsidiary of the Gidding & Lewis Tool Machine Company, manufacturers of the Gidding & Lewis horizontal boring mills.

A. M. Leoni, the designer of Tioga tractors, is going to Baltimore with the Steinmetz company to be at the head of engineering and of production, and H. F. Gleason, present general manager of the Taylor-Wharton Tractor Division, will become associated with the Steinmetz company in an advisory capacity.

Willys Will Make Motors in Buffalo

BUFFALO, Aug. 28—The Churchill street plant of the Curtiss Aeroplane & Motor Corp. will be reopened by the J. N. Willys interests for the manufacture of automobile motors and storage batteries. When the plant is in full operation it is expected employment will be given to 4000 persons. The Curtiss company, which is controlled by the Willys interests, has concentrated its airplane manufacturing at Garden City.

The plant here will be used for the manufacture of 4-cylinder motors for the Willys-Knight and 6-cylinder engines for Overlands. The USL storage battery will be made in a separate department. M. C. Harrold, who managed the plant for the Curtiss company, probably will remain in charge.

WILLYS ON SHORT TIME

TOLEDO, OHIO, Aug. 28—Willys-Overland 5 day a week schedule likely will be continued during September, according to Vice-Pres. C. A. Earl. It was hoped to get back to normal operation at the end of this month, but conditions at the plant are believed to make it necessary to continue the curtailed schedule.

Find Motor Sales High in Mexico

Car Use Growing There, Mexico City Dealer Has Found, and Believes Future Bright

NEW YORK, Aug. 30.—The use of automobiles in Mexico is steadily growing and the markets of that country will continue to increase in interest to the manufacturers of this country. That opinion was expressed here to-day by Senor P. C. Lange, president of the Compania Automotriz Mexicana of Mexico City. He is visiting in New York prior to making a short trip to Europe.

Mr. Lange's company has the representation in Mexico City and in most of Mexico for the Hudson-Essex cars, Pierce-Arrow cars and trucks, Republic trucks and Goodrich tires. Maintaining both sales and service stations in Mexico City and having branches in the larger cities throughout the republic, his company is, without doubt, one of the largest in that city.

"Conditions are quiet and there have been few disturbances of any nature," Mr. Lange said. "This is particularly true of Mexico City, and we hope now that the future will hold much of progress and of business stability."

In many respects the automobile business in Mexico City is much like that in the United States. It is conducted along similar lines and the problems of salesmanship and service are much the same. Some weeks ago, Mr. Lange found that rail transportation tie-ups were cutting into his business, but that situation has now been rectified, a recent rail shipment from Detroit, through Laredo, Tex., having reached Mexico City in 28 days. Although that shipping time was rather fast, Mr. Lange is now finding that his shipments are coming through the Laredo gateway with little difficulty.

Higher-Priced Cars Have the Call

The sales of the higher-priced cars in Mexico City are surprisingly large in contrast with the smaller and lighter cars, Mr. Lange declared. His heaviest business has been with the seven-passenger enclosed cars, but he is finding that the business in all sizes of enclosed cars is large. In selling in Mexico City he is equipping his cars with wire wheels and with five tires, those changes being made to suit local customs that probably grew out of the pre-war sales of European made cars. He finds that practically all of the better known makes of American made automobiles are offered for sale in Mexico City, but so far there has been no competition from the European factories. Several of the European companies have carried on advertising campaigns, but so far their cars have not appeared.

In selling to the interior, Mr. Lange has found it advisable to equip his cars

with magnetos. In Mexico City, however, battery equipment is giving satisfaction and he sells his cars thus fitted.

The road situation, as with other Latin-American countries, is the greatest drawback to further sales, he believes. There has been little road activity throughout the Republic, as government expenditures have utilized available funds for other purposes. Mr. Lange, however, is hopeful that this will be changed in the near future, and that with more stabilized conditions Mexico will see many of her natural resources properly developed.

There is now no shortage of gasoline in Mexico City, he said, although there have been several price fluctuations. The price is about 40 cents per gallon, with an almost inexhaustible supply of petroleum to draw upon.

With business conditions as they are many new automobile and repair shops are being opened, not only in Mexico City but in the other cities of the country. These are naturally in response to the growing use of cars and other automotive equipment, but they point out that the Republic will be of greater and greater sales importance.

Rolls-Royce Plant in Production Jan. 1

SPRINGFIELD, MASS., Aug. 30.—Rolls-Royce of America, Inc., expects to have chassis built and ready for testing by Jan. 1, 1921. By that time between 600 and 700 men will be employed. More than 125 already are at work, including tool room inspectors, millwrights and those in the automatic machine section. The office force takes in another 100 persons.

The heads of the construction departments, most of whom are here now, all were trained in the British works. George J. Bagnell, works manager, served 15 years in the English plant, and for 6 years was the assistant works manager there. Thomas Nadin, general superintendent, was with the British Rolls-Royce for 17 years, and Maurice Otley, the chief engineer, served the company 10 years in England.

SINCLAIR PLANT RUNNING

NEW YORK, Aug. 28.—The creditors' committee and the new board of directors of the Sinclair Motors Corp. are having a thorough audit made and a survey of the plant completed before deciding upon future plans for the company. Release from attachment of sufficient funds of the company to permit continued operation of the plant has been arranged and it is hoped to avert a receivership. Operating expenses have been cut to a minimum and outside contracts have been obtained to keep the machinery going. Three vice-presidents have resigned to make room on the directorate for representatives of the creditors. They are George W. Dunham, R. L. Notman and H. A. Goddard. Their places have been taken by Edwin Krause, Charles Margerum and George Bausman.

Industry Essential Ohio Bankers Told

Columbus Automotive Trade Association Starts Back Fire Campaign

COLUMBUS, OHIO, Aug. 28.—The first guns in the campaign started by the Columbus Automotive Trade Association, aided by the Ohio Automobile Trade Association, to show the public that the motor vehicle is a necessity, were fired at the annual picnic of the former association.

In the absence of F. E. Moskovics, vice-president of the Nordyke & Marmon Co., Indianapolis, who was to speak on the subject, Attorney Franklin Rubrecht of Columbus delivered a convincing argument showing the great necessity and usefulness of the automobile and motor truck. He emphasized the close connection of the motor vehicle to every business, civic and social activity of the nation and showed what had been accomplished in that industry during the World War.

He declared that the motor car industry was the most vital in the country, pointing out the facility and certainty of motor transportation as compared with the stagnation of railroad transportation. He declared that bankers were too conservative in financing manufacturers and dealers in motor vehicles and said that the industry was still in its infancy.

Rubrecht attributed the present strain on financial resources largely to wild cat oil and mining promotions and not to the automobile industry.

"The industry cannot be killed off by any financial pressure, although it may be hampered," he said.

He urged dealers to tell their bankers about it and above all advertise it.

Guests of the Columbus Automotive Trade Association upon the occasion were about a score of Columbus bankers. R. H. Schryver, president of the Citizens Trust & Savings Bank, spoke for the bankers. He urged conservatism in the automobile industry, asserting that the financing of business at present caused a heavy drain upon the finances of the country. He asked that the dealer sell motor vehicles for cash so far as possible in order to relieve this strain, charging that persons without sufficient means were purchasing motor vehicles.

TRAILER COMPANY RECEIVER

INDIANAPOLIS, Aug. 31.—The Van Briggie Mfg. Co., makers of the Van Briggie trailer and affiliated with the Van Briggie Motor Device Co., went into the hands of a receiver yesterday upon application of the Houghton Lumber Co. of this city. The petition alleges that the company has \$50,000 indebtedness and cannot pay the Houghton company's claim of \$2,437. William E. Reiley was appointed receiver by Judge Carter in Marion County Superior Court.

Federal Aid Road Fund Is Exhausted

Director MacDonald Says Early Action by Congress Is Imperative

WASHINGTON, Aug. 30—Unless Federal action is taken during the current fiscal year concerning Federal aid in road building the resulting uncertainty as to the future of this work will seriously handicap the States and cause the entire road-building program to suffer a serious setback, according to Thomas H. MacDonald, chief of the Bureau of Public Roads, United States Department of Agriculture. In discussing the need of Federal action this year, Mr. MacDonald points out that the last installments of Federal aid funds, namely, \$100,000,000, became available July 1, 1920. When to this is added at least an equal amount of State funds, as required by law if States are to secure Federal aid, funds will be available sufficient to carry the road-construction program forward for the current year. But MacDonald points out that the States should know at least a year in advance what funds are to be available in order that plans can be made for future construction.

In the accompanying table is shown the last installment of the Federal aid appropriation and the apportionments to the several States. The total represents the sums appropriated less 3 per cent set aside for administration. When these funds have been taken further appropriations will be necessary.

Alabama	\$1,578,662
Arizona	1,030,233
Arkansas	1,263,883
California	2,291,006
Colorado	1,316,819
Connecticut	460,012
Delaware	122,006
Florida	860,585
Georgia	2,022,863
Idaho	919,537
Illinois	3,273,000
Indiana	2,015,289
Iowa	2,160,996
Kansas	2,153,433
Kentucky	1,463,816
Louisiana	1,021,673
Maine	720,172
Maryland	630,243
Massachusetts	1,104,591
Michigan	2,168,750
Minnesota	2,131,567
Mississippi	1,355,687
Missouri	2,540,924
Montana	1,505,242
Nebraska	1,600,306
Nevada	957,258
New Hampshire	311,129
New Jersey	890,667
New Mexico	1,198,850
New York	3,728,919
North Carolina	1,709,290
North Dakota	1,152,170
Ohio	2,779,685
Oklahoma	1,726,858
Oregon	1,182,114
Pennsylvania	3,443,959
Rhode Island	174,942
South Carolina	1,077,014
South Dakota	1,211,834
Tennessee	1,696,435
Texas	4,396,198
Utah	847,181
Vermont	337,557
Virginia	1,483,255
Washington	1,083,470
West Virginia	795,114
Wisconsin	1,908,709
Wyoming	925,286

Total\$72,750,000

Grasshoppers Trapped With Aid of Tractor

DETROIT, Aug. 28—Ford Motor Car Co. has received a letter from a Minnesota farmer regarding Ford tractors which were used to overcome the grasshopper ravages in that section. The writer states that a trough 10 ft. long, 14 in. wide and 6 in. deep was constructed with a heavy screen, curved on the top, attached to the back of the trough and extending several inches above it. Scantlings nailed to this trough were attached to the front axle and the tractor sent through the field shortly before sundown when the "hoppers" settled for the night.

This contraption moving through the grain, operated most successfully as a "hopper" trap and caught 10 bushels of the pests. And the man who used the same device, according to the letter, got 20 bushels as one evening's harvest. The trough was half filled with water and a quantity of petroleum poured over the top, killing the "hoppers" as they flew against the screen and fell back into the trough.

Canada to Attempt Continental Flight

OTTAWA, Aug. 28—A trans-Canada flight, half way by seaplane and the other half by airplane, is contemplated by the Canadian Air Board, the effort to be made toward the end of next month, according to a statement issued by Hugh Guthrie, chairman of the board. It is felt that the work of the board has now advanced to such an extent that some practical demonstration should be given of the possibilities of air navigation.

It is proposed to start from Halifax, N. S., and to reach Vancouver, B. C., with stops en route at Sault Ste. Marie, Winnipeg and Calgary and other places. Should wind and weather conditions prove favorable, this trip may be made in between 40 and 50 hours, including the time of stops, but a good deal will depend on weather conditions.

The air board has now practically completed the survey of an airline across the continent and the publication of the information obtained may be expected in the near future. Camp Borden has been fitted as the chief air station for Canada. Training of airmen will take place extensively at this point. Very little expenditure was needed to put the buildings at Camp Borden in shape for an air camp, and much valuable material, including aircraft of all descriptions, has now been received from Great Britain and is being installed at Camp Borden. The value of these aircraft, which were presented by Great Britain to Canada as a free gift, amounts to about \$7,000,000. A seaplane station is being established at Halifax.

Automobiles Used as Business Helps

Analysis of 575 California Sales Contracts Proves Essentiality

SAN FRANCISCO, Aug. 28—Further evidence of the undeniable fact that passenger automobiles are essential is presented by the L. F. Weaver Co., dealers in commercial paper, in data covering 500 conditional sales contracts made by country dealers and 75 made by San Francisco dealers.

These figures show that of the 500 country contracts, 190 were with farmers who employ their cars for the usual farm and family use; 59 were with country merchants, 46 of whom used their cars for business; 25 were with contractors, all but two of whom used their machines for business purposes; 22 were with professional men, of whom 16 used automobiles for business; 31 with bookkeepers, clerks, salesmen and stenographers, 18 of whom used cars for business; 24 were with mine and ranch foremen, of whom 13 used cars for business; 99 with laborers, all but 16 for business; 43 with mechanics, all but 12 for business, and 7 with miners, all but one for business.

The same general proportions were carried out in the city contracts, nearly half of which were with merchants, of whom nearly three-fourths used the cars for business.

The Weaver Co. points out that one of the reasons for the false assumption by bankers that automobiles are luxuries is that most of them have forgotten that not so long ago the purchase of horses, wagons, carriages and accessories was financed on time much as automobiles are now, and on the ground that they were an essential means of transportation.

Fageol Trucks Now Made in Cleveland

CLEVELAND, Aug. 28—The Fageol compound truck, which has been built at Oakland, Cal., for the past three years, is now being manufactured in this city as well. The plant here was established largely because of the difficulty experienced in shipping the truck from the Pacific Coast.

The Fageol Motors Co. of Ohio is headed by F. R. Fageol, founder of the California company. Associated with him is Calvin Eib, who left the management of the Denver branch of the Willys-Overland Co. to assume the position of vice-president in charge of sales of the Fageol company. Fageol has brought I. H. Crow from Oakland where he has been superintendent of machine shop production; S. E. Hutton as secretary and treasurer of the new company, and A. E. Jurs as general superintendent in charge of production.

Receivers Named for Standard Parts

Company Is Solvent Assertion of Judge

Takes Only Way Open to End Feud and Bring About Reorganization

(By a Staff Correspondent)

CLEVELAND, Sept. 1—After a prolonged but vain attempt to reconcile the differences which have caused civil war between the majority and minority stockholders, Judge D. C. Westenhaver appointed receivers for the Standard Parts Co., a \$25,000,000 corporation, in Federal District Court here to-day. The men he named were Frank A. Scott, treasurer of the Warner & Swasey Co., and J. O. Eaton, president of the company, who has been the storm center of the controversy.

The receivership was asked ostensibly by the Erie Malleable Iron Co. of Erie, Pa., which has a claim of \$81,214.57, but in reality it was brought about by Eaton and his associates after Judge Westenhaver had granted injunctions restraining them from issuing \$8,000,000 of 5-year 8 per cent notes to retire \$6,000,000 of 6 per cent notes, and 80,000 shares of common stock of no par value as provided in a refinancing plan approved by the majority stockholders. These suits were instituted by L. H. Perlman, former president of the Perlman Rim Co., and Thomas, Richard and Frank Prosser, also stockholders.

Declares Company Solvent

In appointing the receivers, Judge Westenhaver declared emphatically that the corporation is not insolvent. It has debts of only \$9,500,000 and assets of approximately \$22,000,000. He expressed the hope that the receivership would be only temporary and that the property soon would be restored to the stockholders. It was apparent, he added, that some central control was necessary to prevent disintegration and to bring about a complete rehabilitation of the property. In the hope of assuring this happy outcome, he named Scott as one of the receivers because of the prominence he achieved about ten years ago by his successful administration of the affairs of the Cleveland Railway Co. as its receiver. Eaton was named because the interests he represents dominate the company.

The action taken by the court was in compliance with a plan suggested by a committee named by him after a con-

ference between attorneys representing the various interests. It was construed by Eaton as a distinct victory for himself and the other company officials.

The committee which recommended the receivership after it became apparent no headway could be made at a general conference, was composed of interested individuals and companies. Its members were F. H. Goff, president of the Cleveland Trust Co.; A. V. Cannon, attorney for the Erie Malleable Iron Co.; Eaton; H. C. Robinson, vice-president of the Guardian Savings & Trust Co.; Leon F. Payne of the Carnegie Steel Co. and Luther Day, S. H. Tolles, W. C. Boyle and Horace Andrews, attorneys for creditors.

Immediately after the adjournment of court, the receivers went into conference with the attorneys and committees representing the creditors and stockholders to work out a plan for reorganization and refinancing that will assure working capital. Judge Westenhaver named three committees to work with the receivers. They are:

Committees Appointed

Creditors: F. H. Cobb, G. A. Coulton, John Sherwin, A. H. Weigand, Cyrus Eaton, Payne, E. E. Walker, H. L. Thompson and Robinson.

Preferred Stockholders: H. P. McIntosh, F. F. Prentiss, D. E. Blossom, F. H. Hobson and T. E. Burton.

Stockholders: F. A. White, F. F. Prentiss, T. E. Burton, Maynard Murch, E. J. Hess and Perlman.

Perlman and Murch will represent the minority stockholders. Murch resigned as a director recently because he was not satisfied with the refinancing plan.

The court proceedings to-day followed a five-hour conference yesterday with Judge Westenhaver of attorneys representing the Standard Parts Co., the two groups of stockholders and the creditors. The judge acted as arbiter and at the close of the session announced that no amicable agreement could be reached for a settlement of the company's financial difficulties. For this reason, he said, it would be necessary to take the whole question into court.

The conference was called at the court's suggestion in the hope of averting a receivership, but it became evident the internal dissension was so bitter there was no hope of bringing about an amicable settlement in the conference room.

Sidney S. Meyers, general counsel for the Motor and Accessory Manufacturers Association, opposed a receivership.

Action by Perlman Brings Showdown

Entire Industry Interested in Litigation—Two Injunctions Asked

(By a Staff Correspondent)

CLEVELAND, Aug. 31—The Standard Parts feud and the litigation resulting from it has caused intense interest in the automotive industry. This is due in part to the fact that interest in the affairs of the company has not died out since the retirement of Christian Girl and the appointment of J. O. Eaton as president in his place.

The two suits which led to the receivership after they had been decided adversely to Eaton were filed by Day, Day & Wilkin, attorneys for L. H. Perlman and Thomas, Richard and Frank Prosser, minority stockholders. Perlman is said to own \$500,000 of the company's stock.

In the first petition filed in Federal Court the plan sought to be enjoined was the issue and sale of \$8,000,000 of five year 8 per cent notes and 80,000 shares of common stock without par value as provided in the reorganization of the company. The price was to be \$950 and accrued interest for each \$1,000 note and ten shares of common stock. This issue was to supplant a \$6,000,000 six months' issue of notes which mature Sept. 5.

A Common Pleas Court suit was against the old and new directors to procure either the return of or further payment for 9000 shares of common stock issued to Eaton under contracts by which he accepted the presidency and merged the Eaton Axle Co. with the Parts company.

Eaton Gets \$36,000 Salary

According to Roger C. Hyatt of Tolles, Hogsett, Ginn and Morley, representing the Standard Parts Co., Eaton took control of the Standard Parts Co. last February at a salary of \$36,000 a year for three years. In addition, 24,000 shares of common stock were set aside for Eaton and the Eaton Axle Co., 9000 shares to go to Eaton and 15,000 shares to be held in trust to be delivered over a period of three years to the axle organization.

Hyatt stated that Mr. Eaton accepted the presidency of the company upon the urgent request of stockholders, directors and others substantially interested in the company and under a contract by which certain shares of common stock were to be issued to him and to members of the

(Continued on page 495)

Australasia Ready to Buy Light Cars

Clarkson Says New Zealand and
New South Wales Offer
Fine Market

NEW YORK, Aug. 28—J. B. Clarkson, who controls a large automotive distributing company in the Australasian group of islands, was in New York last week in search for a popular priced light car for his territory. After inspecting the Skelton car here, he departed for St. Louis to look over the Skelton plant. He will continue his journey westward, sailing from a Pacific Coast port for his home in Sydney, N. S. W. Clarkson controls the sales of the Kelly-Springfield tires and the Excelsior motorcycles in his territory.

Until recently Clarkson was managing director of the Hope Gibbons Sons and J. B. Clarkson, Ltd., with offices at Wellington and Christchurch, N. Z., and Sydney. He also has been for several years a director of the De Dion-Bouton factory and he has sold these cars in his territory. He still controls this sale but has been unable to get a sufficient number of cars since the armistice. He does not expect to see a popular priced French car in his territory for some time.

Trade prospects in New South Wales and in the entire Australasian group of islands are very good, despite the high cost of running a motor vehicle there, according to Clarkson. Crops promise well and local conditions are very good. Especially cheering was Clarkson's view of the entire automotive industry. He said:

"We are now talking about a slump in the industry in all parts of the world and there is no dispute that we are undergoing some changes. But to my mind, the automotive industry is too well established to suffer heavily. Financial and other readjustments are necessary at times but our great point is that the internal explosion engine has proven its ability to handle short haul freight and passengers more efficiently and more economically than railroads and other track methods of transportation. The flexibility of the automotive traffic, the door delivery and other features cannot be disputed.

"For these indisputable reasons our industry is certain to recover from any temporary shocks it may receive at this time and to keep on in its development."

DORRIS NOT INVOLVED

ST. LOUIS, Aug. 28—The Dorris Motor Car Co., which is making and marketing the Dorris car, is not involved in any way in the application for a receivership for the Dorris Motors Corp. filed by four stockholders of the latter company. The Dorris Motors Corp. is a holding company which was organized by B. R. Parrott to take over the Dorris Motor Car Co. under the name of the

Astra Motors Corp. Parrott failed to establish his company after selling considerable stock. He also is said to have used \$40,000 of his own money in the enterprise. His contract with the stockholders of the Dorris Motor Car Co. to purchase their stock lapsed some time ago and the Dorris company is proceeding calmly with the production of cars under the direction of G. P. Dorris.

Lynn Workers Show Decline in Efficiency

LYNN, Aug. 30—The greater part of the small motors department of the local plant of the General Electric Company is to be moved to Bridgeport, Conn. Several hundred workers either will be dropped from the payrolls or transferred to other departments, although plans had previously been made for doubling the production of this department.

Manager Rice attributed the step taken by the directors of the company to the failure of the Lynn employees to keep pace with the employees in other plants. He said that until the employees decide to produce work to their full capacity and not curtail production no additions can be made to the Lynn department.

"MECO" IS NEW ALLOY

INDIANAPOLIS, IND., Aug. 30—A new alloy which resists corrosion by acids and alkaline solutions has been developed by the metallurgical laboratory of the Midwest Engine Co. It has been named "Meco," and Midwest officials declare that it will resist all acids except nitric, and almost all alkalis. They say it can be cast, rolled, welded or brazed without offering difficulties common to other acid-resisting metals. "Meco," when burnished, is of nickel color, and it takes a high, silverlike polish, which it retains. The Midwest company expects the new alloy to be generally used on automobiles as it will withstand the effects of weather and retain its polish.

NEW FINANCE COMPANY

CINCINNATI, OHIO, Aug. 28—Articles of incorporation for the American Finance Co. of this city will be filed soon, with an authorized capital of \$5,000,000 for the purchase of secured notes from automobile, motor truck and farm tractor dealers. It is the first company in Cincinnati to undertake the work and has the backing of a large number of strong business men. Interested in the organization are Joel C. Clore, postmaster of Cincinnati; E. Wesselmann, county clerk; James I. Stephenson, president of the Cincinnati Iron and Steel Co., and George W. Platt, president of the Platt Bros. Co.

LATVIA IMPORTS CARS

NEW YORK, Aug. 25—The importation of heavy motor cars, according to a recent announcement in London, is now permitted into Latvia, on the payment of a 2 per cent ad valorem duty.

Future Oil Supply in Devonian Shale

Falls Cities of Ohio River Could
Develop Rich Industry, Ex-
pert Declares

LOUISVILLE, Aug. 28—Through development of the Devonian shale with its crude oil content and valuable by-products, the Falls Cities of the Ohio possess a means of becoming one of the leading industrial centers of the United States, according to Prof. H. A. Buerk, New Albany, Ind., superintendent of schools.

In a speech before the New Albany Chamber of Commerce, Professor Buerk related the history of the shale and predicted that the future supply of gasoline and lubricating oils will be obtained from it.

Professor Buerk exhibited an ounce of the oil, which he said he had distilled from less than a pound of shale, and declared that by proper distillation about fifteen gallons can be obtained from a ton of the shale.

The Devonian shale, formed of myriads of fishes which infested the Devonian seas during a prehistoric era, underlies New Albany and Jeffersonville to a thickness of 104 feet, reaching out south far into Kentucky and north almost to Indianapolis, according to the lecturer.

Chemists Making Investigations

One of the by-products from the shale is a residue that becomes the body of Portland cement, Professor Buerk said. Distillation, he explained, results in the shale giving up hydrocarbon, some in the form of gas and some in the form of oils of varying specific gravity. From refining these crude oils scientists are getting gasoline, kerosene, ammonia and paraffin, he declared.

Professor Buerk predicted that distillation of the shale will be commenced "in the not far distant future" on an immense scale. He declared that it would be a "good business proposition." Present interest in development of the shale has been accentuated because the "supply of petroleum will not meet the present and future demands," he said.

"Shale is a hardened clay in which there is so much organic matter that it darkens the color," Professor Buerk said. "Because of the pressure of the overlying stratum of rock the clay has hardened and formed the so-called slate.

"The source of carbonaceous matter is due in all probability to myriads of fishes and lower form of animal life that inhabited the Devonian Sea.

"As there lived in those days no more highly developed animal than the fish there were no enemies that could destroy the increasing numbers. They swarmed the seas and the dead became mixed with the ooze, which in time became shale."

Keener Competition Predicted by British

Believed to Be Foreshadowed by
Ford and Maibohm Price
Cuts

LONDON, Aug. 20—According to the American Chamber of Commerce in London, what may be the beginning of a general drop in the price of motors is foreshadowed by the announcement that Ford and Maibohm cars are to be considerably reduced in Great Britain. The reduction in the case of the Maibohm will amount to £100, and in the case of Fords will vary from £25 for ordinary touring cars to £50 for 1-ton standard trucks.

This move is taken by British manufacturers to mean that real competition has now commenced and that supply is at last catching up with the demand, although in this connection it is reported that one firm has orders to the value of nearly £12 million sterling to work off.

The general view of the reduction is, however, says the American Chamber, that next year when the new motor taxation comes into force the American car will be hit more than the British, and the reduction is designed to meet this disadvantage.

At the present time British manufacturers are facing formidable competition from American, French and Italian firms. France and Italy have both safeguarded their home markets by a prohibition on imports, while America has an import duty of 45 per cent, and is stated to have laid down an export program of one million cars for 1920.

Another serious factor is the restriction on output in Great Britain caused by the 44-hour week and the opposition to overtime. The output of American workmen is almost double that of the British workmen, and as manufacturers are only just finishing war contracts they are likely to be severely hampered in peace production and in the competition which seems inevitable.

Stocks of Gasoline Fast Being Reduced

WASHINGTON, Aug. 28—Statistics compiled by the Bureau of Mines show that during June 307 refineries were operating with a daily capacity of 1,601,295 barrels of crude petroleum as against 292 refineries with a daily capacity of 1,356,355 barrels in December, 1919. The daily average of crude run to the stills was 1,163,536 barrels. This is 73 per cent of the rated capacity of the plants as against 77 per cent in December, 1919.

Gasoline continues a high record of production during June and the six months' production is approximately 13 per cent larger than the first six months of 1919.

The domestic consumption of gasoline during the first half of 1920 is 28 per cent greater than during the same period

of 1919, while the total consumption of gasoline is approximately 32 per cent more.

Although stocks reached a higher total in 1920, the seasonal decline began in May or two months earlier than in 1919. At the end of June stocks were 89,841,009 gallons or 15 per cent less than at the same period in 1919, and 73,616,194 less than at the end of May. A continuation of this rate of consumption will bring the stocks to less than a month's production at the end of July, a condition similar to that existing in 1918.

Louisville Will Get Two Automotive Plants

LOUISVILLE, Aug. 28—Another automobile body plant will be in operation in Louisville within the next two months, according to announcement made by Leo Klarer, Jr., secretary-treasurer of the Southern Wood Products Company. He said he could not divulge the company's plans in detail but that the new factory would be built on the site purchased six months ago from the West Louisville Brewing Company, whose plant was destroyed by fire about one year ago.

The new plant will be in addition to the present factory, which is devoted exclusively to turning out building wood and material.

Another proposed automotive industrial improvement includes building of a new plant by the Shuler Axle Manufacturing Company, which will cost, it is said, about \$1,000,000. The new factory will be built on the old Central Stockyards Company property, east of Floyd Street, between the Southern Railway and Louisville & Nashville Railroad tracks, South Louisville. The company makes automobile axles.

Action by Perlman Brings Showdown

(Continued from page 493)

Eaton Axle Co., in lieu of their holdings in the axle company.

Under the financing plan proposed stockholders were given the right to subscribe the entire issue of notes at the same price as the underwriters, but in case stockholders took only \$2,000,000 of the issue the banks would take the remaining portion. The banks did not obligate themselves, however, to take more than \$6,000,000.

Concerning objection by Perlman to the placing of a mortgage against the property, Hyatt said he did not believe the financing could be carried through to meet the Sept. 5 maturity without a mortgage. He also said the directors considered it good financing, although naturally expensive at this time.

In 1917 Perlman brought suits for infringement of patents on a rim against the Firestone Tire & Rubber Co., and also the Standard Welding Co., a subsidiary of the Standard Parts Co. The Firestone suit was withdrawn by Perlman's attorneys, but he was awarded a court verdict against the Standard Welding Co.

Industrial Alcohol Supply Runs Short

Makers Blame Prohibition —
Cuban Molasses Not Utilized
to Full

WASHINGTON, Aug. 28—Depletion of stocks of industrial alcohol has been reported by the Bureau of Internal Revenue, although there has been no appreciable decline in the volume of production. A movement is under way to obtain modifications of the Volstead act or enforcement regulations which will permit manufacturers to start operations on a larger scale. Failure of gasoline producers to keep abreast of domestic needs is taken as an indication that alcohol will soon be needed as a motor fuel, the extent of its use depending almost wholly upon adjustments to automotive equipment.

Officials of the Bureau of Internal Revenue stated to-day that manufacture of industrial alcohol at present was not under handicap from the standpoint of Government requirements, as compared with operations prior to the prohibition laws. Manufacturers have taken exception to this opinion, however, and seek modifications of so-called stringent regulations.

Enormous Waste of Molasses

Government scientists believe that the production of industrial alcohol could be materially increased through more effective distillation of Cuban "black-strap" molasses. The Bureau of Chemistry of the Department of Agriculture estimates that 70,000,000 gallons of this fluid went to waste last year.

Approximately 200,000,000 gallons of black-strap molasses is produced in Cuba annually. Only 85 per cent is converted into industrial alcohol. Practically the entire shipment to this country is controlled by two manufacturing companies. Therefore, the Government has been unable to obtain reliable statistics as to comparative production costs of industrial alcohol.

Dr. Carl L. Alsberg, chief of the Bureau of Chemistry, believes the production of alcohol from waste matter is not economically feasible because of the difficulties in concentrating sufficient quantities for distillation purposes. Calculated on recent tests conducted by the Bureau of Chemistry in a search for cheap and effective gasoline substitutes, 940,000,000 gallons could be produced each year from waste straw. Corn stalks contain too much moisture and require too many chemicals to allow cheap production processes.

BUCHANAN GETS HOTEL

BUCHANAN, MICH., Aug. 28—This city, which is much frequented by automotive traveling men, now has a hotel that it is believed will allay much of the criticism of the town. It is the Hotel Rex, conducted by H. D. Bailey.

Exports of Automobiles, Parts and Tires for June

COUNTRIES	AUTOMOBILES									AUTOMOBILE TIRES				All Other Tires
	—Commercial—				—Passenger—				Parts of	Casings	Inner Tube	Solid Tires		
	Complete Cars		Chassis		Complete Cars		Chassis							
	Number	Dollars	Number	Dollars	Number	Dollars	Number	Dollars						
Austria.....					1	536			102	2,090				
Azores and Madeira Islands.....					141	200,111	8	8,600	47,065	55,934	11,610			
Belgium.....	1	1,400			3	6,822			230					
Bulgaria.....					90	80,480	4	9,695	15,839	69,053	7,101	5,832	89	
Denmark.....	6	18,934			4	4,300			45	14,442				
Finland.....					30	79,023			92,325	95,618	1,773	11,000		
France.....	40	21,800			2	2,961			1,295	48,944	2,053			
Germany.....			1	700	20	23,708			58	358			13	
Gibraltar.....									1,198	15,187	1,943	418		
Greece.....	1	3,161							742					
Hungary.....	1	2,750			19	34,583	43	32,227	53,028	54,312	1,843			
Iceland and Faroe Islands.....			2	3,000	26	16,408			221	253	78			
Italy.....	2	1,056			371	400,069	8	19,100	189,793	174,623	28,657	3,805	1,812	
Malta, Gozo and Cyprus Islands.....	8	15,613	24	54,605	519	541,847	2	2,294	32,588	98,718	10,939	4,981	534	
Netherlands.....	62	130,531	60	101,371	1	2,443			3,921	4,700	7,400	7,367		
Norway.....			25	24,144	7	16,124			29,874	5,444	68	290		
Poland and Danzig.....	8	12,700							1,955	9,426	8,060			
Portugal.....					256	423,343	5	5,641	33,910	152,908	15,721	4,750	90	
Roumania.....	18	49,666	9	15,529	451	530,502	5	8,300	30,821	112,746	11,575	1,276	1,462	
Spain.....	30	59,545	16	25,053	117	171,318			4,333	41,542	1,256			
Sweden.....					75	61,458			25,745	12,482	2,093			
Switzerland.....			10	16,863	1,982	2,211,309	3	7,799	2,028,713	214,474	9,247	1,711		
Turkey in Europe.....	245	278,261	535	747,211	22	45,363			10,036	3,000				
England.....	18	29,801	11	16,768	149	167,475			36,073					
Scotland.....	11	13,926											201	
Ireland.....									405	186	29			
Bermuda.....	3	1,800	2	1,200					167,012	100,705	71,455	9,749		
British Honduras.....	124	264,616	123	238,274	877	1,221,700	43	49,781	2,759,027	167,012	100,705	71,455	9,749	
Canada.....					8	9,404			2,361	1,640	33	595		
Costa Rica.....					19	18,837			5,145	13,145	2,209	500	469	
Guatemala.....					4	2,352			2,867	4,194	656	697	52	
Honduras.....	3	2,750			9	8,777			4,769	70	9		53	
Nicaragua.....					7	7,564			6,379	55,469	8,115	10,658	2,059	
Panama.....	2	990	4	1,980	18	17,382			5,860	8,546	757	1,154		
Salvador.....					260	182,603			75,840	58,212	9,035	8,125	1,627	
Mexico.....	72	65,971	14	39,071					42					
Miquelon, Langley, etc.....	3	16,750	1	2,500	15	22,907	6	8,934	2,800	11,283	2,590	109		
Newfoundland and Labrador.....	1	495			4	2,608			470	812	60			
Barbados.....	5	2,475	1	2,500	35	28,559	1	495	12,715	12,687	3,624	842		
Jamaica.....					7	9,548			11,819	6,425	174	1,750	61	
Trinidad and Tobago.....	3	1,485	3	1,640	9	8,617			2,575	580	89	12,507	564	
Other British West Indies.....	62	162,565	45	132,947	440	449,645	5	4,232	122,942	152,167	25,544	15,293	15,441	
Cuba.....									606	1,817	253			
Virgin Islands of U. S.....					7	7,500			630	402	21			
Dutch West Indies.....	1	2,100	6	3,429	10	9,123			2,390	1,688	394			
French West Indies.....					25	16,560			8,188	8,729	979			
Haiti.....	28	22,573	7	3,433	64	65,671	1	345	14,352	17,578	3,569	1,238	1,675	
Dominican Republic.....			8	26,020	263	360,694	35	23,283	400,515	68,590	7,893	245	335	
Argentina.....									150	908				
Bolivia.....	5	11,600	6	15,810	496	614,647	3	2,400	299,428	65,463	5,992	4,062	45	
Brazil.....	9	15,653	1	4,490	65	57,374	10	5,450	29,255	32,246	3,410	309	1,619	
Chile.....	15	16,128	2	2,219	120	159,254	5	5,620	17,523	16,501	2,173	737	28	
Colombia.....	2	990			6	9,794			4,466	593	85			
Ecuador.....									3,392	2,244	215	105		
British Guiana.....					2	2,000			347	110				
Dutch Guiana.....									115	32				
Paraguay.....	2	9,434	4	4,485	191	161,475			66,074	22,327	1,905	2,979	442	
Peru.....	10	5,450	1	2,640	153	194,543	6	8,459	27,411	64,500	17,357	933		
Uruguay.....	6	2,970	6	3,843	56	50,816			33,096	13,796	2,978		89	
Venezuela.....									157	130				
Aden.....	2	6,100	1	1,744	120	145,587	4	1,500	12,934	17,698	3,074	2,664	192	
China.....	1	1,763			1	1,093			1,912					
Kwantung, leased territory.....					4	2,300	4	1,300	202	1,650			3,220	
Chosen.....					1,138	1,251,470	4	7,070	140,973	66,127	10,955	700		
British India.....	115	281,421	111	174,928	103	101,894			27,640	140,385	7,650	5,500		
Straits Settlements.....	11	23,903	17	35,394	27	44,039	3	6,741	4,786			1,803		
Other British East Indies.....	14	31,645	2	5,800	334	362,437	1	2,233	97,788	12,404	6,466	24,575		
Dutch East Indies.....	15	39,572	40	90,279	107	100,079			619	3,764	791	307		
French East Indies.....	36	26,728	5	16,500	2	3,760			2,265	1,200	257			
Hongkong.....					173	197,282	103	139,877	54,548	17,589	1,355	1,014	697	
Japan.....	32	42,312	93	69,662	52	26,472			239	1,859				
Persia.....			20	10,601	2	3,642			361	1,000				
Siam.....	4	5,600	3	1,540	79	53,549	6	12,000	4,513	946	130			
Turkey in Asia.....	6	10,800	117	133,889	200	248,678	570	572,038	189,330	118,100	9,854	2,853	875	
Australia.....	9	32,933	16	27,624	664	780,005	27	27,265	127,568	223,062	8,224	10,827	4,000	
New Zealand.....									170					
Other British Oceania.....	1	1,200			1	840			92	1,261	69		171	
French Oceania.....	1	2,775							85					
Other Oceania.....									27,486	298,386	71,758	17,369	21,007	
Philippine Islands.....	55	38,400	26	38,177	331	297,609	40	17,326	27,486	298,386	71,758	17,369	21,007	
Belgian Congo.....			1	590	4	2,575				531				
British West Africa.....	44	55,728	110	196,153	51	54,826	18	51,100	38,168	90,990	12,328			
British South Africa.....	6	6,564	28	48,912	639	756,340	3	3,277	96,470	53,297	17,125	39,913	2,557	
British East Africa.....			2	2,022	43	49,931			4,771	16,359	1,496			
Canary Islands.....					7	13,239			3,011	1,313			1,200	
French Africa.....			13	7,290	22	15,595			11,135	827	218			
Kamerun, etc.....	1	1,840	2	2,446	1	1,840			748	124				
Madagascar.....									22					
Morocco.....					36	26,072			468					
Portuguese Africa.....					2	8,537			12,343	60				
Egypt.....	2	3,500			158	172,122			4,865	6,216	188		2,849	
TOTAL.....	1,162	1,858,726	1,535	2,357,776	11,757	13,441,950	976	1,044,412	7,429,188	3,186,857	474,240	283,248	75,277	

Finance Companies Involved in Failure

Two Greene Corporations Hit by Massachusetts Motors Bank- ruptcy

BOSTON, MASS., Aug. 31—Bankruptcy proceedings were begun here yesterday against the Massachusetts Motors Co., Inc., with the request that a receiver be appointed. Soon afterward a special committee representing the stockholders of the Mutual Finance Corp. and the Commercial Finance Corp. made public a report to the stockholders in which it was stated that "the Commercial Finance Corp. has been subjected to a considerable loss by the bankruptcy of the Massachusetts Motors Co."

The two finance companies were organized by the H. V. Greene Co. with headquarters in this city and branches in many parts of the country. Greene also was one of the moving figures in the formation of Massachusetts Motors, which is an association of New England automobile dealers whose retail sales on credit were financed largely by the financing companies. Greene is reputed to be interested in several other automobile financing enterprises. The motors company has branches in Worcester, Springfield and Manchester, N. H.

A statement was issued by John H. Sherburne, counsel for the two finance companies, in which he said that while they had lost heavily he did not believe they were insolvent. He said the impairment of the two concerns could not be estimated accurately until the assets had been assembled. He expressed the hope that investors ultimately would get back 100 cents on the dollar.

The petition in bankruptcy was filed by three creditors, of whom the largest was the John A. Lowell Banknote Company of Boston, with a claim of \$795. The affidavit alleged that the motors company was insolvent, that it had paid certain creditors, that some of its funds in a bank in Springfield had been attached, and that the company had settled with creditors in Manchester, N. H., and Providence who had previously attached property of the company. The company, the affidavit declared, had deposited money in banks in Boston, Springfield, Worcester, Providence and Manchester, which was liable to attachment by creditors.

The stockholders' committee, which was appointed on Aug. 23, reported that Henry V. Greene, president of the H. V. Greene Company, had agreed to make good any impairment of the capital of either of the finance corporations. The committee announced that an exhaustive audit, ordered by the stockholders in April last, had been completed of the two finance corporations and of the First People's Trust, another Greene company subsidiary.

"The Mutual and the Commercial companies," the report said, "are under the same management. The business of these

Exports of Automobiles, Airplanes, Trucks, Farm Tractors, Motorcycles and Parts for June and Twelve Previous Months

	June, 1919		June, 1920		12 Months Ending June			
	No.	Value	No.	Value	1919	Value	No.	Value
Airplanes	4	\$27,000	4	\$28,700	51	\$644,600	63	\$459,394
Airplane parts.....		967,345		9,443		12,216,801		643,270
Commercial cars.....	1,767	3,935,211	2,697	4,216,502	12,921	33,322,485	24,356	41,577,684
Motorcycles	2,943	784,907	2,557	689,485	14,214	3,715,015	35,041	9,550,022
Passenger cars.....	7,879	8,325,563	12,733	14,486,362	41,291	45,852,705	115,519	125,384,025
Parts, not including engines and tires		45,618,287		7,429,188		37,218,783		66,290,667

Engines

	June, 1919		June, 1920		12 Months Ending June			
	No.	Value	No.	Value	1919	Value	No.	Value
Automobile, gas....	4,249	\$699,263	4,108	\$673,619	28,445	\$4,434,244	39,421	\$6,070,449
Marine, gas.....	1,609	465,941	1,083	303,488	8,617	4,130,308	10,230	3,457,524
Stationary, gas....	2,378	390,926	2,832	437,115	23,953	3,444,086	28,584	4,385,447
Tractor, gas	1,588	1,676,527	1,644	1,551,236	20,364	21,997,667	20,160	19,277,357
Total	9,824	\$3,232,657	9,667	\$2,965,458	81,380	\$34,006,667	98,395	\$33,190,777

two companies is restricted almost wholly to loans on the security of automobiles. It was found in several instances the management had been remiss in not supervising more carefully the collateral pledged as security for loans. It was found, especially in the case of the Commercial Finance Corporation, that one of the companies to whom they had loaned considerable money, the Massachusetts Motors, had sold a large number of cars without applying the purchase price against the note which the car secured. Certain other business losses were discovered in each of the companies."

DENIES LAYING OFF MEN

MILWAUKEE, WIS., Aug. 30—Reports that the Federal Rubber Co. of Cudahy, Milwaukee County, Wis., has laid off a considerable number of employees are officially denied by E. H. Fitzgerald, manager of employment, who said that on Aug. 26 the number of employees on the payroll was 1976, or 300 more than at the same time last year. Only about 100 men have been laid off, these being mostly machinists and helpers. Business in mechanical rubber goods is compensating for any decline in tire trade.

FORD NEAR 4000 DAILY

DETROIT, Aug. 28—Ford Motor Car Co. rapidly is reaching a point where it will average 4000 cars a day as the normal output. Following a record-breaking production July 22, when 4200 cars were built, the factory came along last week with a total of 23,481 cars, an average of 3913 and a fraction, for each of the six working days. During the same period 2388 tractors were produced, an average of 398 each day. The plant established the record for tractors June 29 when 545 were turned out in Dearborn and the three assembling plants at St. Louis, Des Moines, Iowa and Kearny, N. J. The tractor record for July was 9766, produced in the four plants.

Bank Credits

Written exclusively for AUTOMOTIVE INDUSTRIES by the Guaranty Trust Co., second largest bank in America.

Freight movement is fast approaching normal, the tonnage loaded for the first week of August surpassing all records. Fear of undue discrimination in the granting of credit, which has characterized some quarters, should be allayed by Governor Harding's statement that the Federal Reserve Board has made no classification of essential and non-essential industries for purposes of extending credit.

Our export balance of trade for July was \$117,000,000, which compares with \$78,000,000 for June. The export trade for July, \$654,000,000, ran moderately ahead of the June figure, \$631,000,000. Imports for the month (\$537,000,000) fell off \$16,000,000 from the June figure.

The increasing demands of the crop-moving season are again reflected in the weekly statement of the Federal Reserve Banks. Net deposits increased last week \$18,551,000 and Federal Reserve Notes in circulation increased \$28,912,000. Bills discounted secured by Government war obligations were larger by \$13,221,000, while total bills discounted increased \$49,066,000. As a consequence, the ratio of gold reserves to Federal Reserve Notes in circulation, after setting aside 35 per cent against net deposits, declined from 48.1 per cent to 47.7 per cent, in spite of an actual increase in cash reserves of \$5,990,000. Total earning assets increased \$45,619,000.

The ruling rate on the local call money market continued at 7 per cent with the range from 7 per cent to 10 per cent as compared with 7 per cent to 9 per cent the week previous. The time money market continued stagnant, with rates unchanged at 8½ per cent for mixed collateral and 9 per cent to 9½ per cent on all-industrial money.

The weekly statement of the Clearing House institutions indicates a slightly improved condition as compared with the previous week. There was an increase of \$12,804,520 in aggregate reserves over legal requirements, bringing the total excess reserve up to \$14,233,050. Net demand deposits increased \$4,771,000. Cash in vaults increased \$2,742,000. Bills payable, however, increased \$58,475,000.

FINANCIAL NOTES

Stewart-Warner Speedometer Corp. reports for six months ended June 30 show manufacturing income of \$1,470,148 against \$1,373,884 for the corresponding period last year with a surplus after dividends and taxes of \$370,147 compared with \$836,884 for the same six months of 1919. The balance sheet shows cash amounting to \$363,262, notes and accounts receivable of \$2,365,132 and accounts and vouchers payable of \$335,105. The surplus is \$7,796,158.

Spicer Mfg. Co. report for the six months ended June 30 showed earnings of approximately \$1,200,000 after deductions for taxes and other charges. The balance available for common stock dividends in this period was approximately \$1,080,000 as compared with \$1,373,382 for the fiscal year of 1919. The Sheldon Axle and the Parish plants are said to be running at capacity and the Salisbury plant at 70 per cent of normal.

Hupp Motor Car Corp. report for the year ended June 30 shows net earnings of \$2,668,299, equal to \$5.01 per share on the 5,192,100 shares of common stock of \$10 par value outstanding. This compares with \$535,602, equal to 87 cents a share in the previous year. Plant extensions costing nearly \$2,000,000 were financed from the earnings of the company during the year.

Greenfield Tap & Die Corp. stockholders asked to authorize \$5,000,000 eight per cent preferred stock of par value of which \$1,500,000 will be reserved for exchange, share for share to the present outstanding 5 per cent preferred stock, \$2,500,000 to be sold for the retirement of the floating debt and expansion and \$1,000,000 to be held in the treasury.

Stromberg Carburetor Co. reports surplus for three months ended June 30 of \$204,228 after charges. This is equivalent to \$2.72 a share or practically the same as for the preceding quarter. The earnings in the corresponding quarter of 1919 were \$2.47 a share on the 50,000 shares then outstanding. The capital now is 75,000 shares.

Standard Rubber Co. of New Orleans organized with capital of \$5,000,000 to manufacture puncture proof tires. The daily output of the plant by next January is expected to be 1000 tires. Louisiana capital is interested in the company and I. J. McGee of Los Angeles is the principal organizer.

Autocar Co. directors informed that more than 6500 of the 8000 shares of stock recently offered for sale already have been subscribed. The terms of payment on subscriptions are at least half by Sept. 20 and the balance by Dec. 20.

Ford Motor Co., of Canada, reports production of approximately 55,000 cars during its last fiscal year and estimates production for the present year at 75,000, according to a statement to the Stock Exchange.

Kissel Motor Car Co. capital increased from \$1,000,000 to \$2,100,000 to provide for plant extension and improvements made in the last six months. No further additions will be undertaken at present.

Biddle Motor Car Co. attorneys for the company, which is in bankruptcy, are expected to ask the court for authority to return subscriptions paid by stock purchasers in June and July last.

Pennsylvania Rubber Co. directors have declared regular quarterly dividend of 1% per cent on preferred stock and 1½ per cent on common, payable Sept. 30 to stockholders of record Sept. 15.

Receivers Operating
Hess Steel Company

BALTIMORE, Aug. 30—The Baltimore Trust Co. and Clarence C. Pusey, acting as receivers, are operating the Hess Steel Co. plant. They were appointed by Judge Staunton of the Circuit Court of Baltimore, following an action by the trust company which sought to cover itself on sinking fund notes which had been underwritten by the banking company. Henry Hess, president, and A. A. Hess, secretary, officials of the steel concern, agreed to the receivership.

The receivers are empowered to operate the plant until the present orders are filled and to take from time to time business as may be necessary in the operation of the plant to fill the larger contracts. The court granted the receivers permission to engage F. D. Carney, an expert, to make a survey of the plant for full valuation. The business was reported to be a \$1,000,000 concern. The court has also at various times given permission to the receivers to borrow sufficient money to meet the weekly payrolls, which exceed \$14,000.

The Commercial Credit Co. purchased about \$100,000 worth of outstanding bills from the steel company previous to the receivership and the court has signed an order in which all moneys of accounts purchased by the credit company, which are paid to the receivers, must be turned over to the credit company.

The Hess company manufactures parts and certain kinds of steel for many of the large automobile concerns.

CREDIT EXTENSION ASKED

QUINCY, MASS., Aug. 31—The Ross Machine Co., which has been temporarily short of capital to carry on its business and meet its maturing obligations, has asked creditors for an extension of time on all but 10 per cent of their bills. If this arrangement can be made Thomas F. Brown, who has long been connected with the metal trades, will become general manager and have Russell C. Harrington associated with him. The company feels that with this management the business can be established on a solid foundation.

TIRE PRICES GUARANTEED

RACINE, WIS., Aug. 28—The Racine Auto Tire Co. has notified dealers in its tires that it will guarantee until Nov. 1 the prices established March 6 for all its products. It is asserted that the increasing cost of fabric, freight, coal and other materials entering into tire costs make a price decline impossible. The 60-day protection will be continued on all stocks purchased between now and Nov. 1.

U. S. RUBBER IS BUSY

NEW YORK, Aug. 28—The United States Rubber Co. announces that it has not reduced its working forces or made any attempt to curtail production of tires because at no time since the beginning of 1919 has it been able to catch up with orders.

METAL MARKETS

No more significant sidelight on the anomalous situation in the pig iron market has been revealed in some time than the report that emanated from Pittsburgh a few days ago, to the effect that the United States Steel Corporation had been a seller of pig iron at between \$45 and \$50. The report loses not one iota in interest through its having been subsequently denied, presumably by a spokesman for the Carnegie Steel Company, who is quoted as having pointed to the fact that with producing costs much below the current market price for pig iron, the Corporation's policy to keep down prices would undoubtedly cause it to quote not above \$36, furnace, if it wanted to sell pig iron, but that, as a matter of fact, he had absolute knowledge that no open market sales of iron had been made by the Corporation or any of its subsidiaries. The all important fact is that the report with its denial proves conclusively that the United States Steel Corporation appears to consider this the time to sell pig iron, even though it may not be an actual seller itself. Moreover, it considers pig iron worth around \$36. Surely no better guide post for the automotive purchasing agent could be found. In fact, everywhere the impression prevails that the present pig iron flurry will be a short-lived affair. In fact, following sales at higher levels, 1,000 tons of Bessemer sold at \$47, Sharon furnace. One large Detroit automotive interest has ordered a 30 days' suspension on its iron deliveries.

Steel—Requests from automotive buyers to postpone shipments are not without effect on the market, which is generally softening. Hot rolled and cold rolled strip makers assert they will have to advance the 5.50c., respectively 8.50c. base ½c. as the result of the freight advance, but apparently they do not consider that the propitious moment for such a move has come yet. One of the Youngstown steel correspondents makes much of the fact that a maker of automobile sheets was asked to extend the rolling of a certain order of fine finished sheets for several weeks, but refused and notified the buyer he would be glad to cancel. The latter, however, preferred not to cancel, but said he would take the sheets as soon as possible. Automobile frame makers are reported to be offering surplus tonnages of blue annealed sheets at attractive prices.

Pig Iron—Valley furnace men are asking \$50 for foundry. They admit that the advance in freight adds only \$1.50 to their costs, but say their \$4 boost was justified because some buyers were willing to pay it. These buyers, however, were not automotive foundries. Moreover, the market to-day is bare of business at \$50. Birmingham pig can be laid down in Detroit for around \$49.

Lead—Arrivals of foreign lead have forced the price for September deliveries down to 8½c., although the leading American producer continues to quote 9c., New York.

Brass—Leading manufacturers have announced ½c. advance in their base prices for brass and commercial bronze and gilding wire.

Aluminum—The market is quiet. Brokers complain that offers of imported metal at below the price of domestic fall on deaf ears.

Copper—Conversationally the market is improved; actually it is still top heavy from undigested surplus.

Tin—The market is again a football for foreign speculators.

Zinc—Very little change in the ailing condition of the market is noted.

PERSONAL ITEMS

R. G. Hendricks, an old timer in automobile manufacturing circles, whose most recent experience has been in the light truck end, has joined the organization of the King Motor Car Co. as production and factory manager. He succeeds J. W. Paterson who left the King service to accept a position in the Distel Wheel division of the Detroit Steel Products Co. The new production manager spent five years overseas connected with the production departments of Rolls-Royce, Sunbeam, Isotta and Diesel. During the war he devoted his attention to aeroplane engine construction.

F. L. Mowder has joined the Handley-Knight Co. of Detroit as comptroller. He began his business career ten years ago and was a certified accountant in Los Angeles for four years. During the early part of the war he was in charge of the financial division on cantonment construction and later was financial representative of the Air Nitrates Corp., going from there to the Toledo Scale Co.

Edward J. Fisher has resigned as assistant superintendent of the Essex division of the Hudson Motor Car Co. to become factory manager of the United States Auto Gear Shift Co. of Eau Claire, Wis. He has held numerous executive positions with automotive manufacturers.

A. B. Way, until recently secretary and general manager of the Bridgeport Chain Co. has become district sales manager for New England for the Chain Products Co. of Cleveland. He has been identified with the chain industry for many years.

C. M. Love who served 12 years with the Studebaker Corp. of America has been appointed zone manager for the Simms Motor Car Corp. of Atlanta. His territory will include Georgia, Florida, Alabama, Tennessee and North and South Carolina.

C. W. McKinley has been appointed sales manager of the Tillotson Mfg. Co. of Toledo, manufacturers of carburetors. He formerly was with the Willys-Overland Co. where he was designing engineer and production engineer.

Roy Davey, formerly general sales manager of the Bethlehem Motors Corp. who resigned when H. F. Harris became president of that company, has returned to the organization in his former capacity.

Julius Janes, formerly president of the Standard Steel Castings Co. of Cleveland has become sales representative of the Farrell-Cheek Steel Foundry Co. of Sandusky for the Cleveland territory.

Frank Lynn, southwestern representative of The Perkins-Campbell Co., has joined the staff of The Cincinnati Ball Crank Co., which he will serve in a similar capacity, in the same territory.

C. H. McCarter has been made general superintendent of the Locomobile Co. plant at Bridgeport and H. C. Aument manager of the parts department.

FIRE DESTROYS PLANT

FLINT, MICH., Aug. 28—No clue has been developed as to the origin of a fire which destroyed the plant of the Ann Arbor Stamping and Metal Company Monday. Several explosions occurred during the fire, caused by oils and chemicals used in the japanning room. Damage to the plant will be in the neighborhood of \$200,000. The company manufactured automobile license plates,

Chrysler in Detroit
Studying Maxwell

NEW YORK, Aug. 31—Final agreement has not been reached on plans for the reorganization of the Maxwell Motor Car Co. and its merger with the Chalmers Motor Co. Walter P. Chrysler, who heads the management committee, is in Detroit this week with John R. Harbeck, vice-president of the American Can Co., who is associated with him in the management. It is probable announcement will be made while they are there of the appointment of a new general manager to succeed C. C. Hanch.

The report of the Maxwell company for the fiscal year ended July 31 last, is expected to show net earnings of about \$4,250,000 after all charges except depreciation and Federal taxes. In the preceding year net earnings were \$3,229,000, but they were reduced to net profits of \$1,529,500, or \$11.64 a share on the first preferred by deduction of \$930,000 for depreciation, \$600,000 reserve for contingencies and \$170,000 reserve for Federal taxes. Depreciation this year is not expected to exceed \$500,000 and net profits are estimated at \$3,500,000 or \$27 a share on the preferred.

Present financial condition of the company shows no asset value for the common stock and the equity behind the second preferred has been reduced to less than \$50 a share.

EMPIRE AXLE BANKRUPT

DUNKIRK, N. Y., Aug. 30—The Empire Axle Co. of this city, which was controlled by the Watson Products Corp. of Canastota, N. Y., has been adjudged bankrupt by Federal Judge Hazel. The first meeting of creditors will be held in the office of the referee in bankruptcy in this city Sept. 7. The schedules of the company show secured and preferred claims of \$164,619 and unsecured of \$372,696. The nominal assets are \$700,176. Levi S. Chapman of Syracuse, attorney for the Watson company, sent a letter to creditors of the axle company several weeks ago warning them that unless they accepted a proposition of the Watson company to take that company's stock in exchange for their claims, bankruptcy for the Dunkirk concern was inevitable.

IMPORTS SHOW GAIN

WASHINGTON, Sept. 1—Import statistics for July, compiled by the Bureau of Foreign and Domestic Commerce, show a very large percentage increase in the value of automotive equipment brought into this country, as compared with July, 1919, although the total still is almost negligible. Parts of automobiles, excepting tires, imported in July, 1919, were valued at \$1,562, while last month their value was \$155,451. The 26 cars imported in July last were valued at \$63,304, compared with 13 cars valued at \$7,198 the same month last year. American made automobiles returned to this country last month numbered 925, valued at \$1,577,927.

INDUSTRIAL NOTES

The Trailmobile Co. has completed, equipped and occupied its new factory which is said to be the largest in the world devoted exclusively to the manufacture of trailers for use with passenger automobiles and motor trucks. The plant is of saw-tooth construction and is modern in every way with all facilities for the comfort of the employees.

Lockwood Mfg. Co., makers of the Lockwood line of automobile fabric accessories, has removed its Eastern branch office and factory from Brooklyn to Buffalo. Harry B. Lockwood, vice-president, will be in charge. An export sales branch will be maintained in the Grand Central Palace, New York. The main plant is located at Kansas City.

Buick Motor Co. is rushing work on an additional story on factory No. 8 and an addition connecting that building with No. 4 in the hope of completing the improvements within 45 days. The addition will give the factory 128,000 sq. ft. of added floor space. Still another addition to building No. 28 will furnish 105,000 sq. ft.

Burdick Tire & Rubber Co., Noblesville, Ind., proposes to enlarge its plant, which now contains 75,000 feet of floor space. The company is said to be producing 2,000 tires and 2,500 tubes daily. Stockholders have the privilege of buying tires and tubes at a discount of 20 per cent.

Acklin Stamping Co., Toledo, has decided to build a large fireproof factory on a site recently purchased in that city. The capital of the company will be increased from \$50,000 to \$500,000. The present plant employs 250 men and is one of the largest jobbing sheet metal concerns in Ohio.

American Hammered Piston Ring Co. has received an order from Honolulu for 15,000 piston rings. The export department of the company reports a steadily increasing demand from Hawaii for American automotive equipment.

Continental Tire & Fabric Co., Stamford, Tex., has been organized to manufacture cotton products for tires and will build structures costing \$600,000 to house 15,000 spindles. S. M. Strange is president.

National Lamp Works of the General Electric Co. will build two factories in Indianapolis to manufacture incandescent and automobile lamps. The investment will aggregate \$2,000,000.

Gray Machine Tool Co., formerly of Buffalo, has changed its name to the Gray Machine & Parts Corp. It is now operating in a larger plant at Batavia, N. Y.

Wheeling Axle Co., Wheeling, W. Va., has been merged with the Spears Axle Co. of the same city, a division of the Standard Parts Co. Plans for expansion are under way.

General Tractors, Inc., will remove its offices from Chicago to Watertown, Wis., where the principal factory is located.

FORD MEN SELL TRACTORS

DETROIT, Aug. 28—Ford Motor Co. dealers throughout the country now are handling tractors. This is in pursuance of the plan announced several months ago that beginning Aug. 1 all Ford car dealers would handle tractors. While the handling of tractors is not compulsory, according to officials, every dealer is expected to abide by the ruling or suggestion.

Calendar

SHOWS

Aug. 28-Sept. 11—Toronto, Canada. National Automobile Show. Automotive Industries of Canada, in connection with Canadian National Exhibition, Exhibition City.

Sept. 6-11—Indianapolis. Twentieth Annual Fall Automobile Show in connection with Indiana State Fair.

Sept. 18-25—Cincinnati. Annual Automobile Show. Passenger cars only. Cincinnati Automobile Dealers' Ass'n. Music Hall Buildings.

Sept. 20-26—Los Angeles. National Tractor and Implement Show of the West. Tractor and Implement Dealers' Ass'n of Southern California. Guy H. Hall, Mgr.

Sept. 27-Oct. 2—Buffalo. Closed Car Show. Buffalo Automotive Dealers' Ass'n. Elwood Music Hall, C. C. Proctor, Mgr.

Oct. 4-9—Little Rock, Ark. Enclosed Car Show. Little Rock Automobile Dealers' Ass'n.

Oct. 5-9—Minneapolis. Enclosed Car Show. Minneapolis Automobile Trade Ass'n.

Oct. 6-16—New York. Electrical Show. Grand Central Palace. George F. Parker, Manager.

Nov. 14-21—New York. Automobile Salon. Commodore Hotel Ballroom.

Nov. 15-20—Chicago. Automotive Equipment Show. Coliseum. Automotive Equipment Association.

Dec. 10-18—New York. Motor Boat Show. Grand Central Palace.

Jan. 8-15—New York. National Passenger Car Show. Grand Central Palace. Auspices of N.A.C.C.

Jan. 29-Feb. 4—Chicago. National Passenger Car Show. Coliseum. Auspices of N.A.C.C.

Feb. 5-12—Minneapolis. Annual Automobile Show. Minneapolis Automobile Trade Ass'n.

Feb. 6-12—Columbus. National Tractor Show. Columbus

Tractor & Implement Club. Ohio State Fair Grounds.

FOREIGN SHOWS

Sept. 4-25—London. Machine Tool and Engineering Exhibition. Machine Tool Trade Ass'n., Inc., Olympia.

October—London. Commercial Vehicle Show, Olympia.

Nov. 4-13—London. International Motor Exhibition. Society Motor Mfr's and Traders, Ltd., Olympia and White City.

Nov. 6-13—Christchurch, N. Z. Olympia Motors Exhibition.

Nov. 29-Dec. 4—London. Cycle and Motorcycle Show. Cycle and Motorcycle Mfr's and Traders Union, Ltd., Olympia.

Jan. 7—Sydney. Australian Motor Show.

CONTESTS

Sept. 6—Hornell, N. Y. Dirt track.

Sept. 6—Cincinnati, O. Speedway.

Sept. 6—Uniontown, Pa. Speedway.

Sept. 17-18—Syracuse, N. Y. Dirt track.

Sept. 25—Allentown, Pa. Dirt track.

Oct. 1-2—Trenton, N. J. Dirt track.

Oct. 8-9—Danbury, Conn. Dirt track.

CONVENTIONS

Sept. 16-17—Cleveland. Motor and Accessory Manufacturers' Ass'n. Credit Convention.

October—Cleveland. Service Managers' Convention. National Automobile Chamber of Commerce.

Oct. 11-13—Chicago. National Association of Purchasing Agents' Annual Convention.

Dec. 7-10—New York. Annual meeting American Society of Mechanical Engineers. Engineering Societies Building.

Dec. 8-9—Cincinnati. Annual Convention. Ohio Automobile Jobbers' Association.

Jan. 11-13—S. A. E. Annual Meeting, New York City.

British Car Imports Far Exceed Exports

LONDON, Aug. 18 (*Special Correspondence*)—In July, Great Britain imported 3615 cars and 1116 chassis, as against 264 cars and 124 chassis in July, 1919. The country exported 498 cars and 341 chassis as compared with 110 cars and 46 chassis in July, 1919. She imported \$2,891,985 worth of tires and exported \$3,817,520 worth, a figure which should satisfy the fearsome prophets of every evil for the British tire trade, who recently and still are working a stunt on this matter.

Though the exports of British cars and chassis and parts show an increase, indication of increased output and some signs of reserved markets abroad, nevertheless the output of cars, chassis and parts is enormously disproportionate to the imports. The seven months' figures—imports and exports—show this fact strikingly:

From January to July last 22,460 cars and 7792 chassis were imported, as compared with 607 cars and 333 chassis for the like period in 1919. The corresponding British exports for the seven months are 2045 cars and 1327 chassis, as compared with 729 cars and 237 chassis for the like period of 1919. It will be seen, therefore, that relatively the expansion has been in thousands for the imports and in hundreds for the exports.

MAIL TO CUBA BY AIR

WASHINGTON, Aug. 30—Contracts have just been signed here by Postmaster General Burleson for the establishment of an aerial mail, utilizing seaplanes, between Key West, Florida, and Havana, Cuba. The service will be instituted Oct. 15 under a year's contract made with the West Indies Airways Co.

The contract is the first under the recent legal authorization of contracts to carry foreign mail by seaplane. Mail for this service must be marked "via seaplane" and will be at the rate of 6 cents an ounce or fraction of an ounce. Trains to connect with the Havana fliers leave New York at 9:15 o'clock each morning and reach Key West at 10:50 o'clock the next morning. By being cleared immediately, the mail should reach Havana not more than two hours later. The equipment will consist of F-Y-L flying boats mounting two Liberty engines. The machines will carry twelve passengers and mails and express.

LATEX CAPITAL RAISED

FOND DU LAC, WIS., Aug. 30—The Latex Tire & Rubber Co., which recently began operations in its new factory, has increased its authorized capitalization from \$500,000 to \$1,000,000 to accommodate the broadened scope of the business. Large purchases of raw materials are being made, it being stated by F. S. Dannenberg, president of the company, that present prices of rubber are the lowest since 1905. T. W. Meiklejohn, Ford dealer in Fond du Lac, has been added to the board of directors. Early next spring the new factory will be trebled in size by a three-story addition, 60 x 300 ft.

JACKSON HEADS MEET

JACKSON, MICH., Aug. 28—Business expansion plans were discussed by officers and department heads of the Jackson Motors Corp. at a meeting at the City Club. Howard Matthews, president, and Pat Emerson, sales manager, told something of the new line of cars for 1921, sketched the energetic sales program proposed and introduced Cory P. Green as the new chief engineer and factory superintendent.

Only One British Car Seen in Toronto Show

TORONTO, Aug. 28—"Canada's Only National Motor Show," which opened here to-day has four divisions of displays which occupy three buildings. The chief interest of the large number of persons attending the show is in the passenger car and equipment exhibits, but there is a surprising attendance at the truck, motor boat and aircraft exhibitions.

Fifty-five makes of cars are on exhibition, those not being before shown in Canada, or which have been absent from recent shows, are: Auburn, Columbia, Grant, Haynes, Kissell, Mitchell, Moon, Premier, Roamer, Winton and Wolsley. The last named is the only English made car at the show.

A marked development of the show this year is the number of dealers' and other industrial meetings that are being held. At these meetings there is a decided spirit of confidence as to the sales future and the bumper crops promised for this season in the Dominion form quite a part of the conversation of those who are looking to the future for sales.

Several of the new models announced by the American manufacturers are on exhibition, but not enough of them to form the basis of discussion of the tendencies for the next year.

FORD PLANS TERMINALS

DETROIT, Aug. 30—Option on a tract of land containing 483 acres has been obtained by the Ford Motor Co. as a proposed site for additional freight terminals for the D. T. & I. railroad. The tract lies northeast of the village of Flat Rock and a portion of it is adjacent to the present terminal. It is expected that a line will be run from the property acquired to the Ecorse yards or the tracks of the Pennsylvania system may be used as the connection.